TECHNICAL
& SERVICE MANUAL

MCAF94R5IAA + GRF97R5I
MCAF124R5IAA + GRF127R5I

FILE NO.

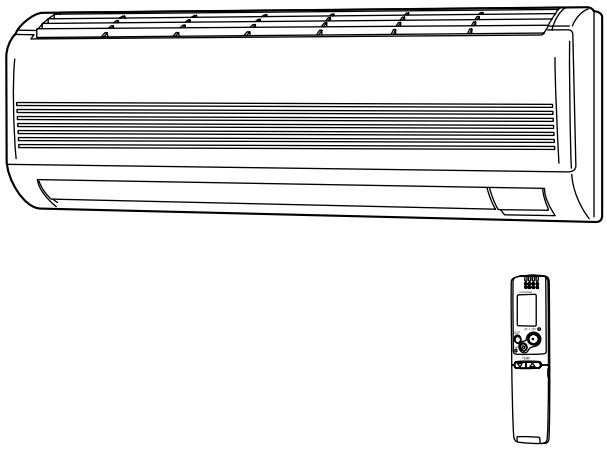
Destination: Europe

DC INVERTER SPLIT SYSTEM AIR CONDITIONER

Indoor Model No.	Product Code No.
MCAF94R5IAA	3 871 300 03 (1 852 345 22)
MCAF124R5IAA	3 871 300 04 (1 852 345 23)

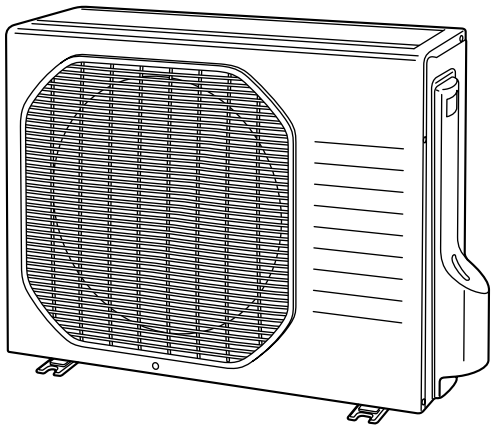
Outdoor Model No.	Product Code No.
GRF97R5I	GRF97R5IAA (1 852 345 25)
GRF127R5I	GRF127R5IAA (1 852 345 26)

Indoor Unit



MCAF94R5IAA
MCAF124R5IAA

Outdoor Unit



GRF97R5I
GRF127R5I

RoHS

- This product does not contain any hazardous substances prohibited by the **RoHS** Directive.

⚠ WARNING

- You are requested to use **RoHS** compliant parts for maintenance or repair.
- You are requested to use lead-free solder.

R410A

These air conditioners employ new refrigerant R410A.
Pay special attention when servicing the unit.

REFERENCE NO. SM700725

Important!
Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.

WARNING **This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.**

CAUTION **This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.**

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING When Wiring

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause accidental injury or death.
- Ground the unit following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing

In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

In a Room

Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls and floors.

In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power off at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Others

CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.

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1. OPERATING RANGE

	Temperature	Indoor Air Intake Temp.	Outdoor Air Intake Temp.
Cooling	Maximum	32 °C D.B. / 23 °C W.B.	43 °C D.B.
	Minimum	19 °C D.B. / 14 °C W.B.	19 °C D.B.
Heating	Maximum	27 °C D.B.	24 °C D.B. / 18 °C W.B.
	Minimum	16 °C D.B.	— D.B. / −15 °C W.B.

2. SPECIFICATIONS

2-1. Unit Specifications

Indoor Unit **MCAF94R5IAA**
Outdoor Unit **GRF97R5I**

Power Source				220 to 240V Single-Phase 50Hz	
Voltage Rating				230V	
Performance				Cooling	Heating
	Capacity		kW	2.65 (0.9 to 3.2)	3.60 (0.9 to 5.0)
			BTU/h	9,000 (3,100 to 10,900)	12,300 (3,100 to 17,100)
	Air Circulation (High)		m^3/h	480	530
	Moisture Removal (High)		Liters/h	1.6	-
Electrical Rating				Cooling	Heating
	Available Voltage Range		V	198 to 264	
	Running Amperes		A	3.86 (1.28 to 5.88)	4.81 (1.21 to 6.47)
	Power Input		W	755 (250 to 1,150)	995 (250 to 1,515)
	Power Factor		%	85	90
	E.E.R.		W/W	3.51	-
	C.O.P.		W/W	-	3.62
	Compressor Locked Rotor Amperes		A	9.5	
Features					
	Controls / Temperature Control			Microprocessor / I.C. Thermister	
	Control Unit			Wireless Remote Control Unit	
	Timer			24-Hour ON or OFF Timer, 1-Hour OFF Timer	
	Fan Speeds	Indoor / Outdoor		Auto and 3 steps / 1 (Hi)	
	Airflow Direction (Indoor)	Horizontal		Manual	
		Vertical		Auto	
	Air Filter			Washable, Anti-Mold	
	Compressor			Single Rotary (Inverter)	
	Refrigerant / Amount charged at shipment		g	R410A / 950	
	Refrigerant Control			Electric Expansion Valve	
	Operation Sound	Indoor : Hi/Me/Lo/Qt*	dB-A	34 / 31 / 28 / 23	34 / 31 / 28 / 23
	(*Qt = Quiet mode)	Outdoor : Hi	dB-A	46	47
	Refrigerant Tubing Connections			Flare Type	
	Max. allowable tubing length at shipment		m	7.5	
	Refrigerant	Narrow tube	mm (in.)	6.35 (1/4)	
	Tube Diameter	Wide tube	mm (in.)	9.52 (3/8)	
	Refrigerant Tube Kit / Accessories			Optional / Air Clean Filter	
Dimensions & Weight				Indoor Unit	Outdoor Unit
	Unit Dimensions	Height	mm	285	548
		Width	mm	825	720
		Depth	mm	189	265
	Package Dimensions	Height	mm	255	600
		Width	mm	900	856
		Depth	mm	350	362
	Weight	Net	kg	9.0	34.0
		Shipping	kg	11.0	36.0
	Shipping Volume		m^3	0.08	0.18

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks: Rating conditions are:
Cooling: Indoor air temperature 27°C D.B. / 19°C W.B.
Outdoor air temperature 35°C D.B. / 24°C W.B.
Heating: Indoor air temperature 20°C D.B.
Outdoor air temperature 7°C D.B. / 6°C W.B.

Indoor Unit **MCAF124R5IAA**
Outdoor Unit **GRF127R5I**

Power Source	220 to 240V Single-Phase 50Hz

Voltage Rating	230V

Performance			Cooling	Heating
Capacity		kW	3.50 (0.9 to 3.8)	4.20 (0.9 to 5.8)
		BTU/h	11,900 (3,100 to 13,000)	14,300 (3,100 to 19,800)
Air Circulation (High)		m^3/h	500	530
Moisture Removal (High)		Liters/h	2.0	-

Electrical Rating		Cooling	Heating
Available Voltage Range	V	198 to 264	
Running Amperes	A	5.21 (1.19 to 6.21)	5.48 (1.18 to 7.09)
Power Input	W	1,090 (250 to 1,300)	1,165 (250 to 1,690)
Power Factor	%	91	92
E.E.R.	W/W	3.21	-
C.O.P.	W/W	-	3.61
Compressor Locked Rotor Amperes	A	9.5	

Features				
Controls / Temperature Control			Microprocessor / I.C. Thermister	
Control Unit			Wireless Remote Control Unit	
Timer			24-Hour ON or OFF Timer, 1-Hour OFF Timer	
Fan Speeds	Indoor / Outdoor		Auto and 3 steps / Auto (Hi, Me, Lo)	
Airflow Direction (Indoor)		Horizontal	Manual	
		Vertical	Auto	
Air Filter			Washable, Anti-Mold	
Compressor			Single Rotary (Inverter)	
Refrigerant / Amount charged at shipment		g	R410A / 1,100	
Refrigerant Control			Electric Expansion Valve	
Operation Sound	Indoor : Hi/Me/Lo/Qt*	dB-A	36 / 33 / 29 / 25	34 / 31 / 29 / 25
(*Qt = Quiet mode)	Outdoor : Hi	dB-A	47	49
Refrigerant Tubing Connections			Flare Type	
Max. allowable tubing length at shipment		m	7.5	
Refrigerant	Narrow tube	mm (in.)	6.35 (1/4)	
Tube Diameter	Wide tube	mm (in.)	9.52 (3/8)	
Refrigerant Tube Kit / Accessories			Optional / Air Clean Filter	

Dimensions & Weight			Indoor Unit	Outdoor Unit
Unit Dimensions	Height	mm	285	548
	Width	mm	825	720
	Depth	mm	189	265
Package Dimensions	Height	mm	255	600
	Width	mm	900	856
	Depth	mm	350	362
Weight	Net	kg	9.0	35.0
	Shipping	kg	11.0	37.0
Shipping Volume		m^3	0.08	0.18

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks: Rating conditions are:
Cooling: Indoor air temperature 27°C D.B. / 19°C W.B.
Outdoor air temperature 35°C D.B. / 24°C W.B.
Heating: Indoor air temperature 20°C D.B.
Outdoor air temperature 7°C D.B. / 6°C W.B.

2-2. Major Component Specifications

2-2-1. Indoor Unit

Indoor Unit **MCAF94R5IAA**

Control PCB				
	Part No.			CB-KRV93EH
	Controls			Microprocessor
	Control Circuit Fuse			250V 3.15A
Remote Control Unit				RCS-3HVPSN4E
Fan				
	Type			Cross-Flow
	Q'ty ... Dia. and Length		mm	1 ... D92 / L634
Fan Motor				
	Type			AC Motor
	Model ... Q'ty			IBH-884-066 ... 1
	No. of Poles			4
	Rough Measure RPM (Cool / Heat)			1,200 / 1,250
	Nominal Output		W	30
	Coil Resistance (Ambient Temp. 20 °C)		Ohm	BRN - WHT : 234 PNK (RED) - WHT : 209
	Safety Device	Type		Thermal fuse
		Operating Temp. Open	°C	130
		Close		-
	Run Capacitor		Micro F	1.2
			VAC	440
Flap Motor				
	Type			Stepping Motor
	Model			MP24Z3
	Rating			DC 12V
	Coil Resistance (Ambient Temp. 25 °C)		Ohm	Each Pair of Terminal : 400 +/- 7%
Heat Exchanger Coil				
	Coil			Aluminum Plate Fin / Copper Tube
	Rows			2
	Fin Pitch		mm	1.3
	Face Area		m^2	0.188

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Indoor Unit **MCAF124R5IAA**

Control PCB				
	Part No.			CB-KRV123EH
	Controls			Microprocessor
	Control Circuit Fuse			250V 3.15A
Remote Control Unit				RCS-3HVPSN4E
Fan				
	Type			Cross-Flow
	Q'ty ... Dia. and Length		mm	1 ... D92 / L634
Fan Motor				
	Type			AC Motor
	Model ... Q'ty			IBH-884-066 ... 1
	No. of Poles			4
	Rough Measure RPM (Cool / Heat)			1,250 / 1,250
	Nominal Output		W	30
	Coil Resistance (Ambient Temp. 20 °C)		Ohm	BRN - WHT : 234 PNK (RED) - WHT : 209
	Safety Device	Type		Thermal fuse
		Operating Temp. Open	°C	130
		Close		-
	Run Capacitor		Micro F	1.2
			VAC	440
Flap Motor				
	Type			Stepping Motor
	Model			MP24Z3
	Rating			DC 12V
	Coil Resistance (Ambient Temp. 25 °C)		Ohm	Each Pair of Terminal : 400 +/- 7%
Heat Exchanger Coil				
	Coil			Aluminum Plate Fin / Copper Tube
	Rows			2
	Fin Pitch		mm	1.3
	Face Area		m^2	0.188

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

2-2-2. Outdoor Unit

Outdoor Unit **GRF97R5I**

Control PCB		
Part No.		CB-CRV93EH
Controls		Microprocessor
Control Circuit Fuse		250V 20A

Compressor		
Type		Single Rotary (Hermetic)
Compressor Model / Nominal Output		G4C090LU1ER / 600W
Compressor Oil ... Amount	CC	FV50S ... 320
Coil Resistance (Ambient Temp. 20 °C)	Ohm	U - V : 0.81 V - W : 0.81 W - U : 0.81
Safety Device		
CT (Peak current cut-off control)		Yes
Compressor Discharge Temp. Control		Yes
Operation cut-off control in abnormal ambient Temp.		Yes
Run Capacitor	Micro F	-
	VAC	-
Crankcase Heater		-

Fan		
Type		Propeller
Q'ty ... Dia.	mm	1 ... D400

Fan Motor				
Type				AC Motor
Model ... Q'ty				IB-976-501 ... 1
No. of Poles				6
Rough Measure RPM (Cool / Heat)				700 / 700
Nominal Output			W	20
Coil Resistance (Ambient Temp. 20 °C)			Ohm	WHT - BRN : 213 RED (PNK) - WHT : 168
Safety Device	Type			Thermal fuse
	Operating Temp.	Open	°C	150
		Close		-
Run Capacitor			Micro F	2.0
			VAC	440

Heat Exchanger Coil		
Coil		Aluminum Plate Fin / Copper Tube
Rows		2
Fin Pitch	mm	1.4
Face Area	m^2	0.288

External Finish	Acrylic baked-on enamel finish

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Outdoor Unit **GRF127R5I**

Control PCB		
Part No.		CB-CRV123EH
Controls		Microprocessor
Control Circuit Fuse		250V 20A

Compressor		
Type		Single Rotary (Hermetic)
Compressor Model / Nominal Output		G4C090LU1ER / 600W
Compressor Oil ... Amount	CC	FV50S ... 320
Coil Resistance (Ambient Temp. 20 °C)	Ohm	U - V : 0.81 V - W : 0.81 W - U : 0.81
Safety Device		
CT (Peak current cut-off control)		Yes
Compressor Discharge Temp. Control		Yes
Operation cut-off control in abnormal ambient Temp.		Yes
Run Capacitor	Micro F	-
	VAC	-
Crankcase Heater		-

Fan		
Type		Propeller
Q'ty ... Dia.	mm	1 ... D400

Fan Motor		
Type		DC Motor
Model ... Q'ty		DAJ12-55J71-CR ... 1
No. of Poles		8
Rough Measure RPM (Cool / Heat)		750 / 750
Nominal Output	W	50
Coil Resistance (Ambient Temp. 20 °C)	Ohm	-
Safety Device		
Type		Internal Controller
Over- Current Protection		Yes
Over- Heat Protection		-
Run Capacitor	Micro F	-
	VAC	-

Heat Exchanger Coil		
Coil		Aluminum Plate Fin / Copper Tube
Rows		2
Fin Pitch	mm	1.4
Face Area	m^2	0.367

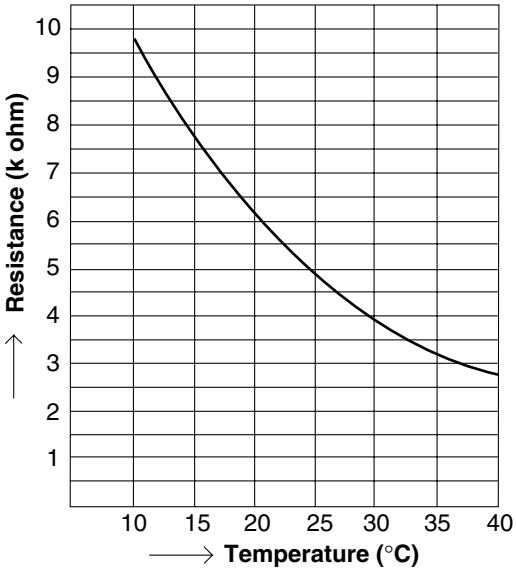
External Finish	Acrylic baked-on enamel finish

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

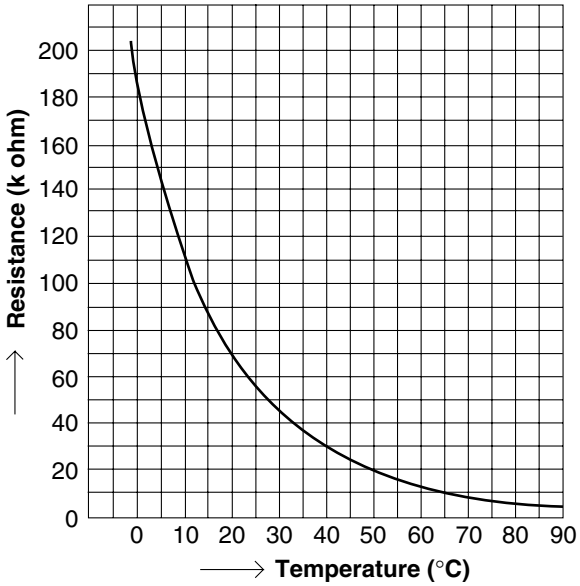
2-3. Other Component Specifications

Indoor Unit	**MCAF94R5IAA**	**MCAF124R5IAA**
Outdoor Unit	**GRF97R5I**	**GRF127R5I**

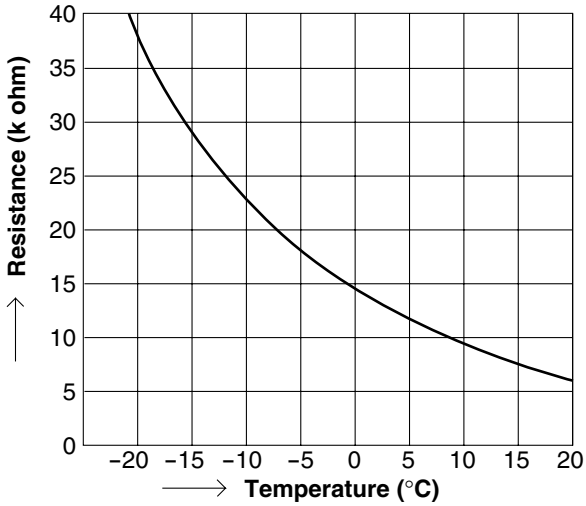
• Indoor air temp sensor
(Model:PTM-D51H-S3-2 TH2)



• Indoor heat exchanger sensor
(Model:PTM-D51H-S3-2 TH1)
• Compressor temp sensor
(Model:1FA4V2E025900)

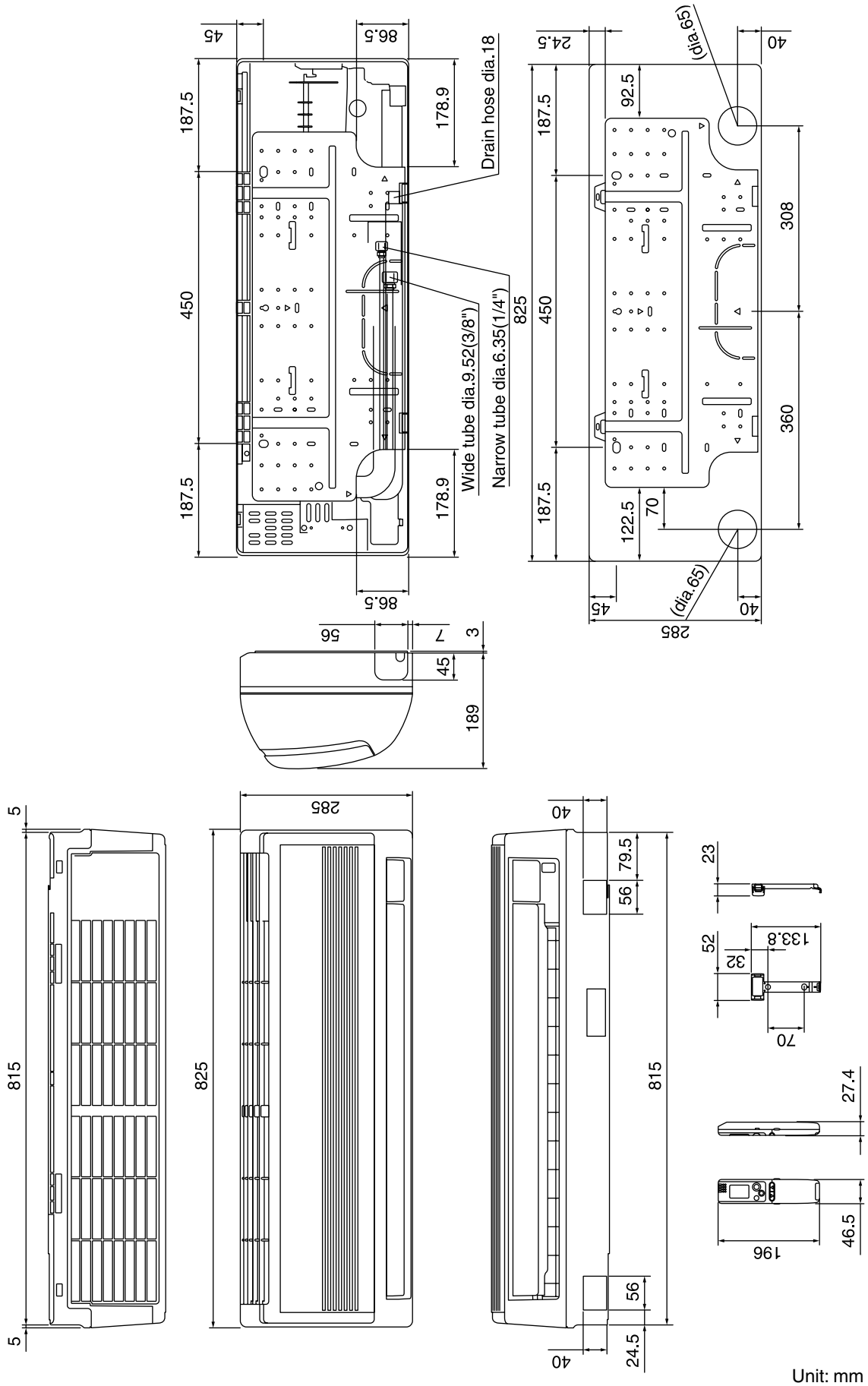


• Outdoor air temp sensor
(Model:TKS269B)
• Outdoor heat exchanger sensor
(Model:1FA4V2E025900)



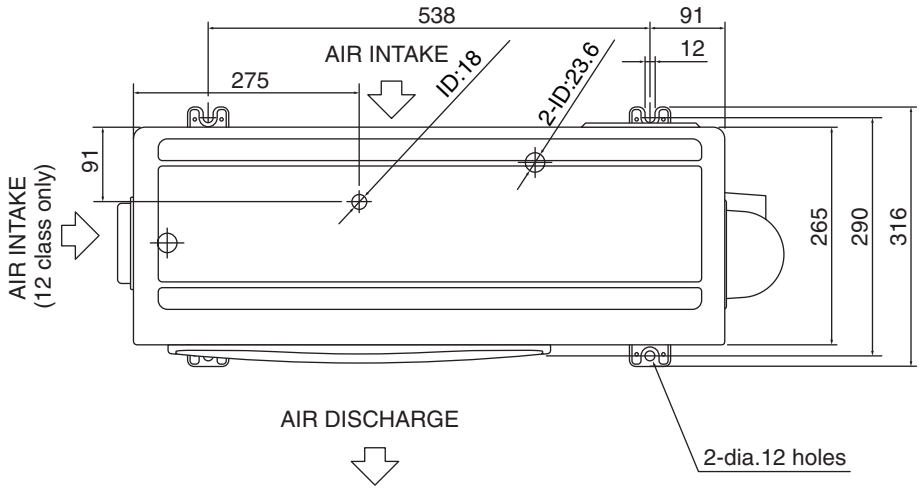
3. DIMENSIONAL DATA

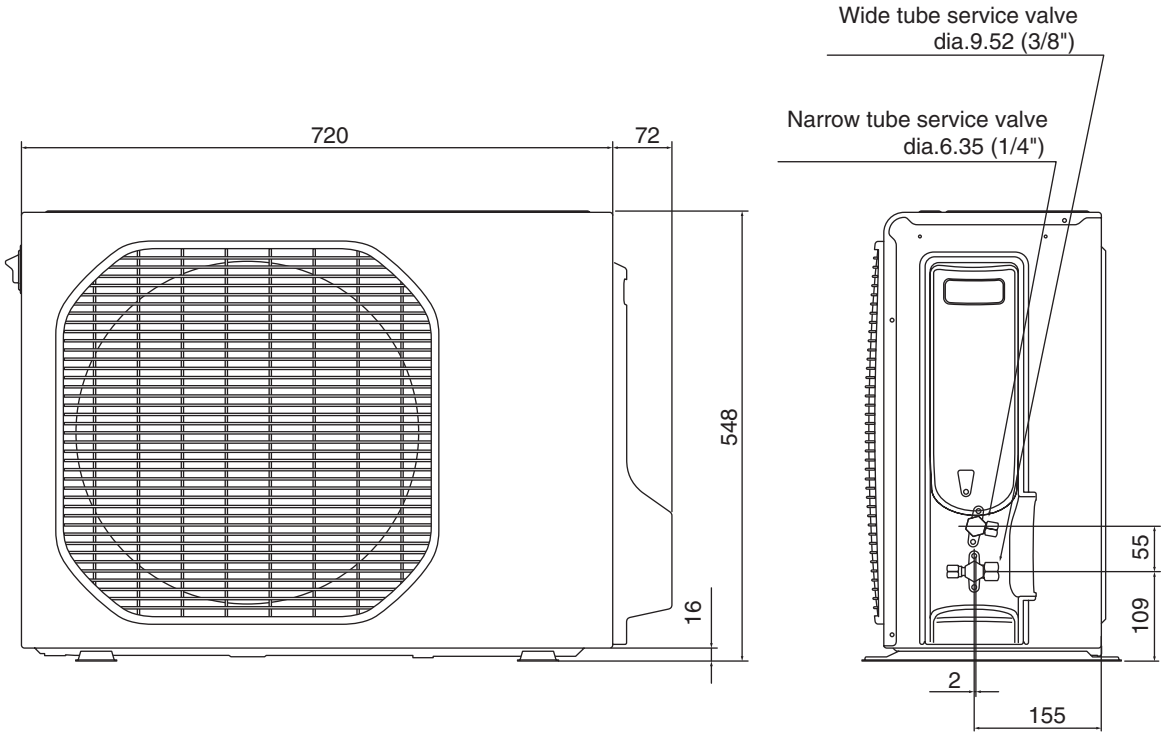
Indoor Unit **MCAF94R5IAA**
MCAF124R5IAA



Unit: mm

Outdoor Unit **GRF97R5I**
GRF127R5I



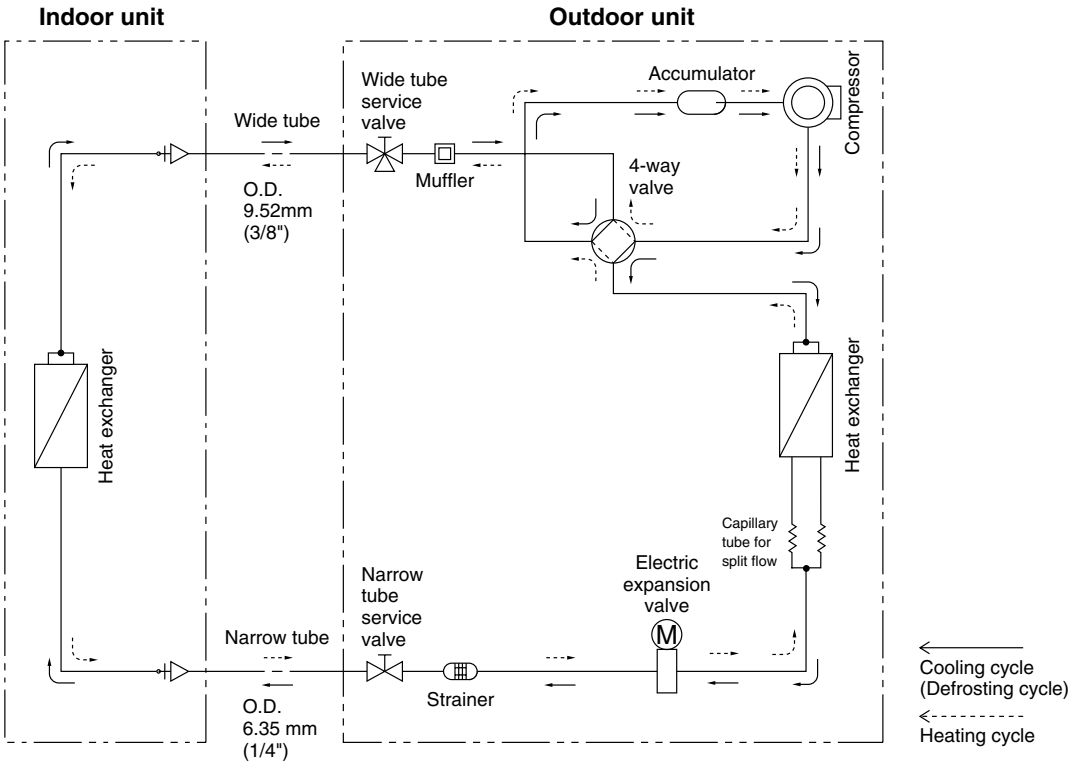


Unit: mm

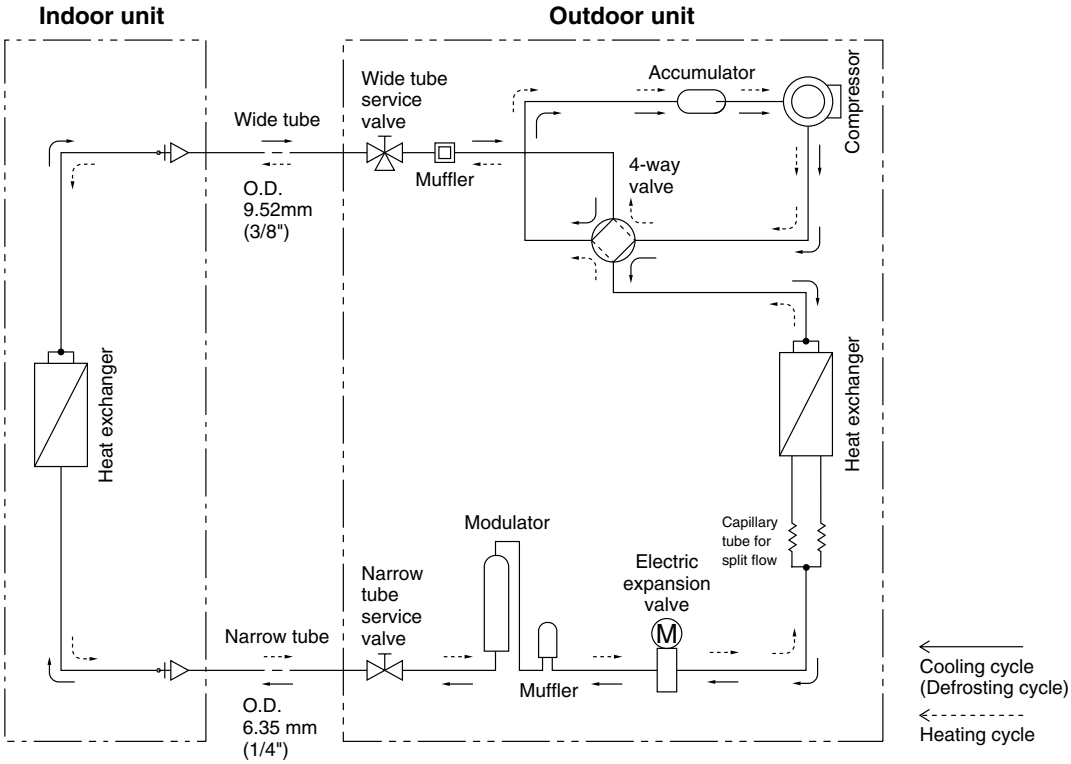
4. REFRIGERANT FLOW DIAGRAM

4-1. Refrigerant Flow Diagram

Indoor Unit **MCAF94R5IAA**
Outdoor Unit **GRF97R5I**



Indoor Unit **MCAF124R5IAA**
Outdoor Unit **GRF127R5I**

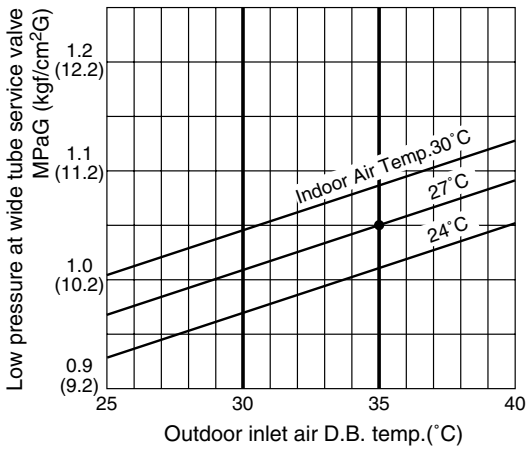


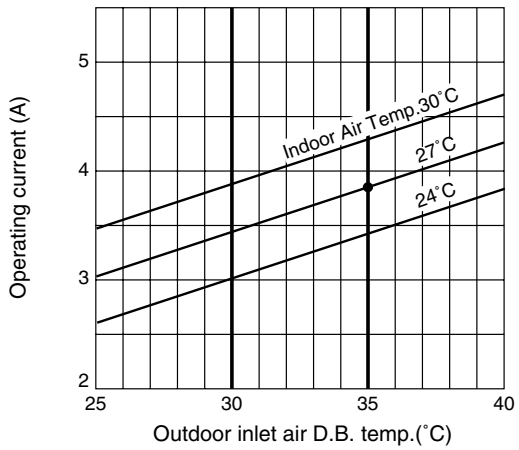
5. PERFORMANCE DATA

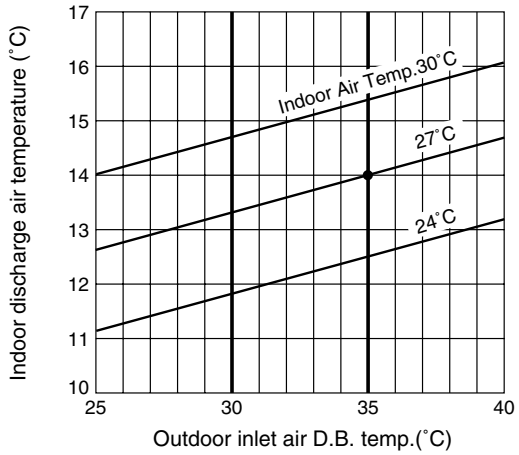
5-1. Temperature Charts

Indoor Unit **MCAF94R5IAA**
Outdoor Unit **GRF97R5I**

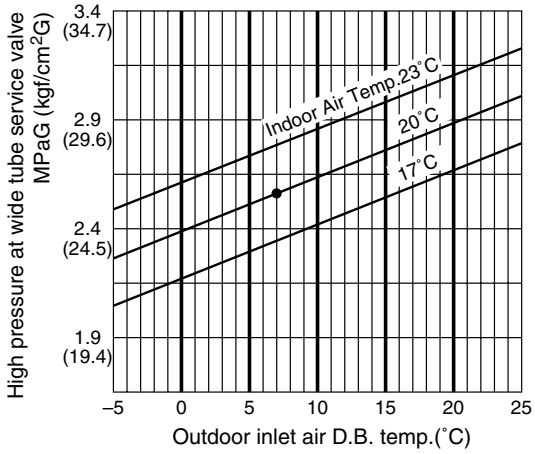
■Cooling Characteristics

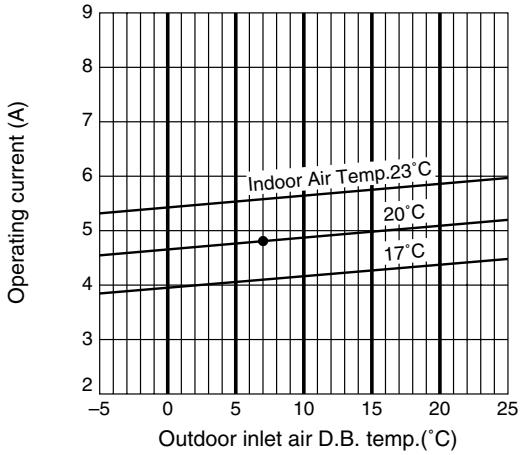


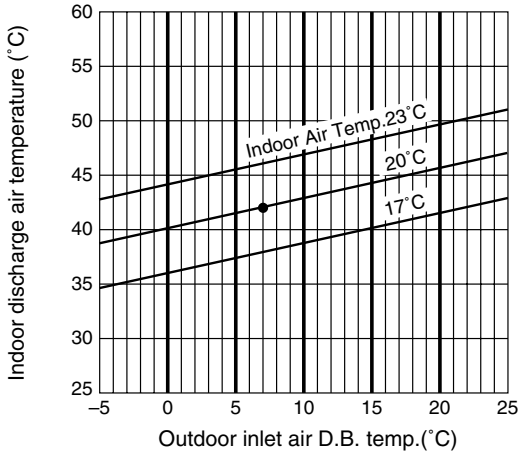




■Heating Characteristics







NOTE

- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value.
- Overload prevention operates to protect the air conditioner when outdoor ambient temperature becomes extremely high in heating mode. (Refer to "9-2. Overload prevention during heating.")

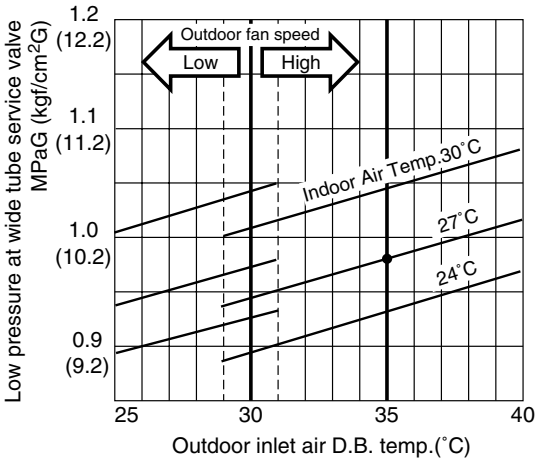
●:Points of rating condition
Black dots in above charts indicate the following rating conditions.

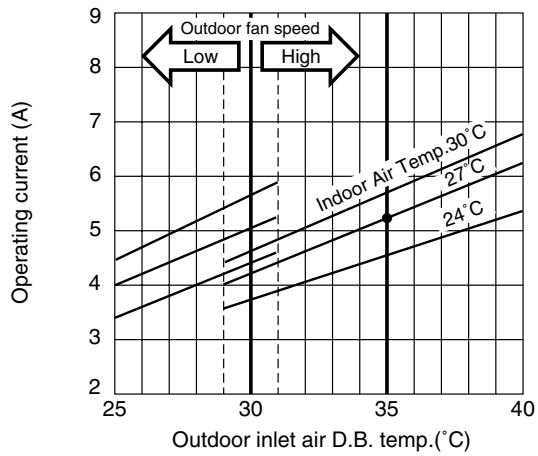
Cooling: Indoor air temperature 27 °C D.B. / 19 °C W.B.
Outdoor air temperature 35 °C D.B. / 24 °C W.B.

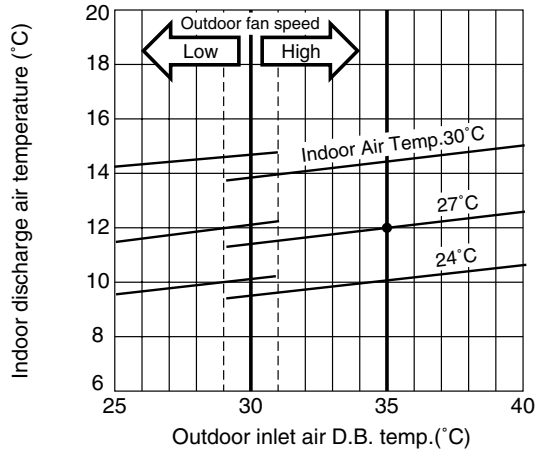
Heating: Indoor air temperature 20 °C D.B.
Outdoor air temperature 7 °C D.B. / 6 °C W.B.

Indoor Unit **MCAF124R5IAA**
Outdoor Unit **GRF127R5I**

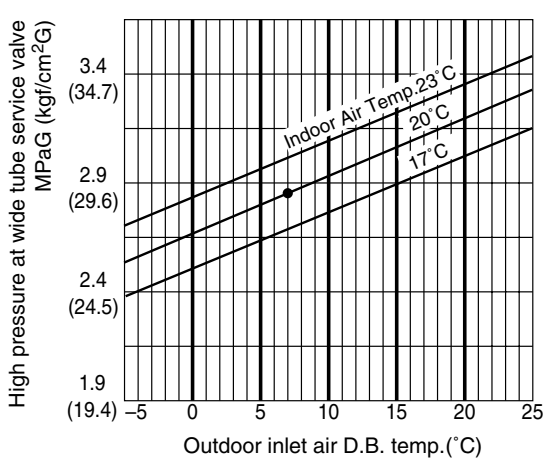
■Cooling Characteristics

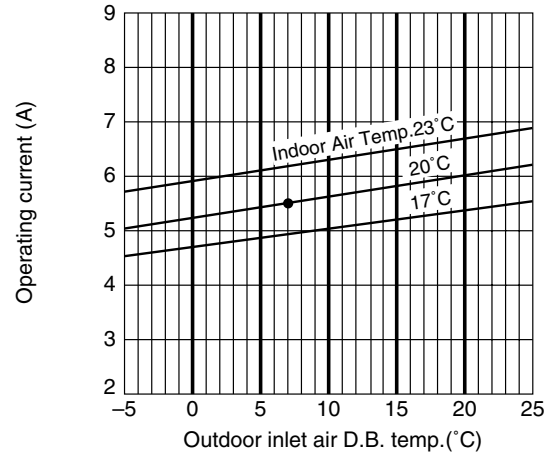


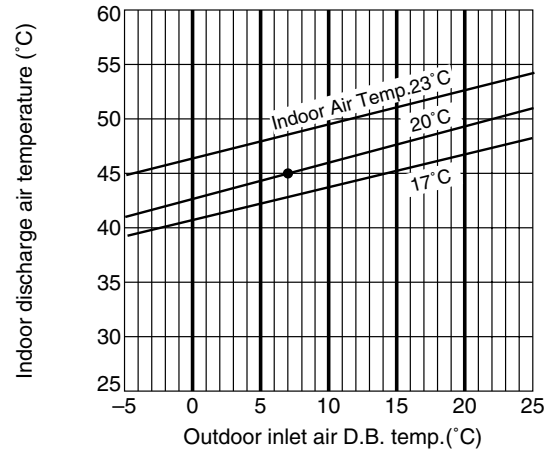




■Heating Characteristics






Indoor discharge air temperature (˚C)
60 55 50 45 40 35 30 25
Indoor Air Temp.23˚C
20˚C
17˚C
–5 0 5 10 15 20 25
Outdoor inlet air D.B. temp.(˚C)

NOTE

- Check each performance value in test-run mode. Electrical performance values represent a combined indoor/outdoor value.
- Overload prevention operates to protect the air conditioner when outdoor ambient temperature becomes extremely high in heating mode. (Refer to "9-2. Overload prevention during heating.")

●:Points of rating condition
Black dots in above charts indicate the following rating conditions.

Cooling: Indoor air temperature 27 °C D.B. / 19 °C W.B.
Outdoor air temperature 35 °C D.B. / 24 °C W.B.

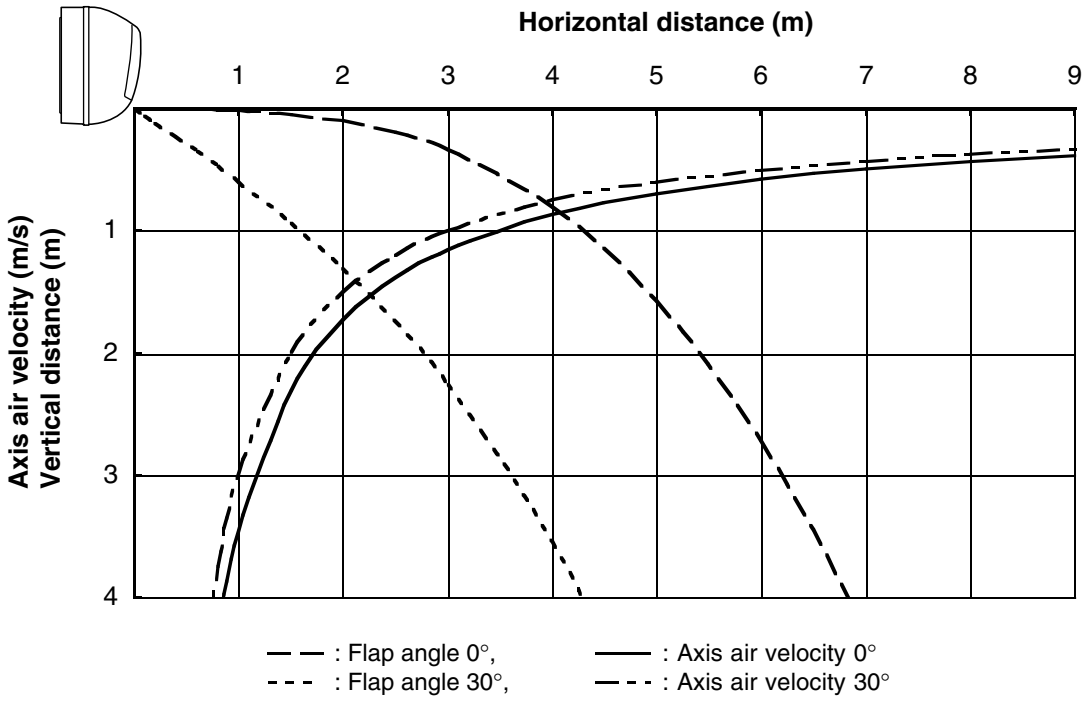
Heating: Indoor air temperature 20 °C D.B.
Outdoor air temperature 7 °C D.B. / 6 °C W.B.

5-2. Air Throw Distance Charts

Indoor Unit **MCAF94R5IAA**

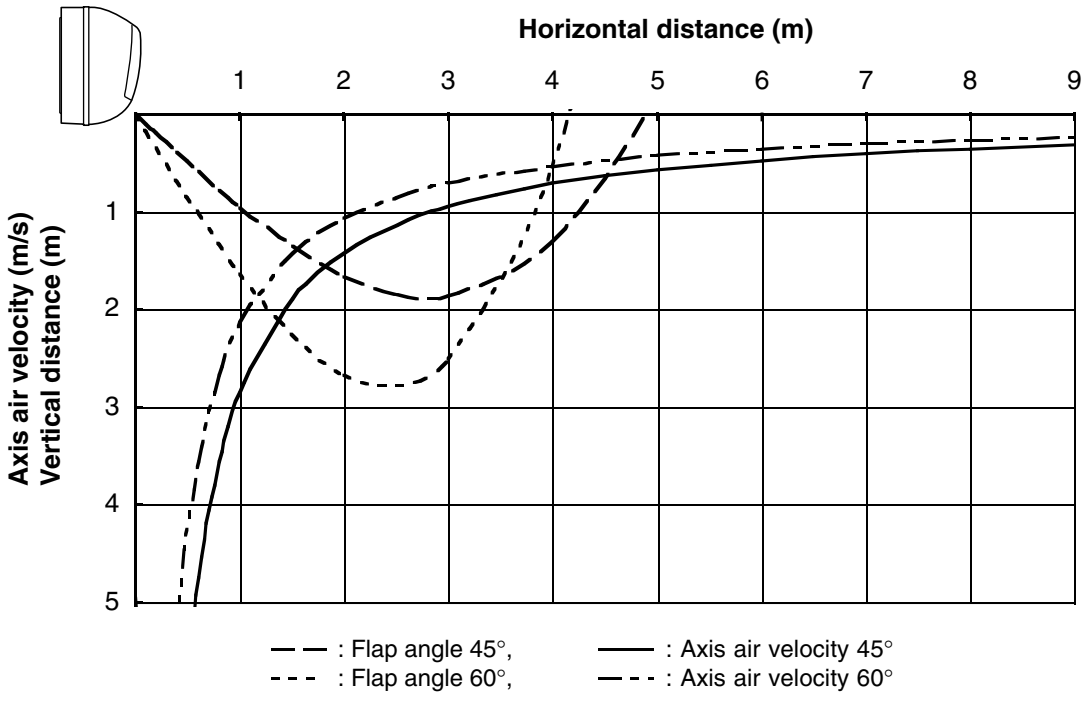
Cooling

Room air temp. : 27°C
Fan speed : High


Horizontal distance (m)
1 2 3 4 5 6 7 8 9
Axis air velocity (m/s)
Vertical distance (m)
1
2
3
4
— — : Flap angle 0°,
- - - : Flap angle 30°,
——— : Axis air velocity 0°
— - - : Axis air velocity 30°

Heating

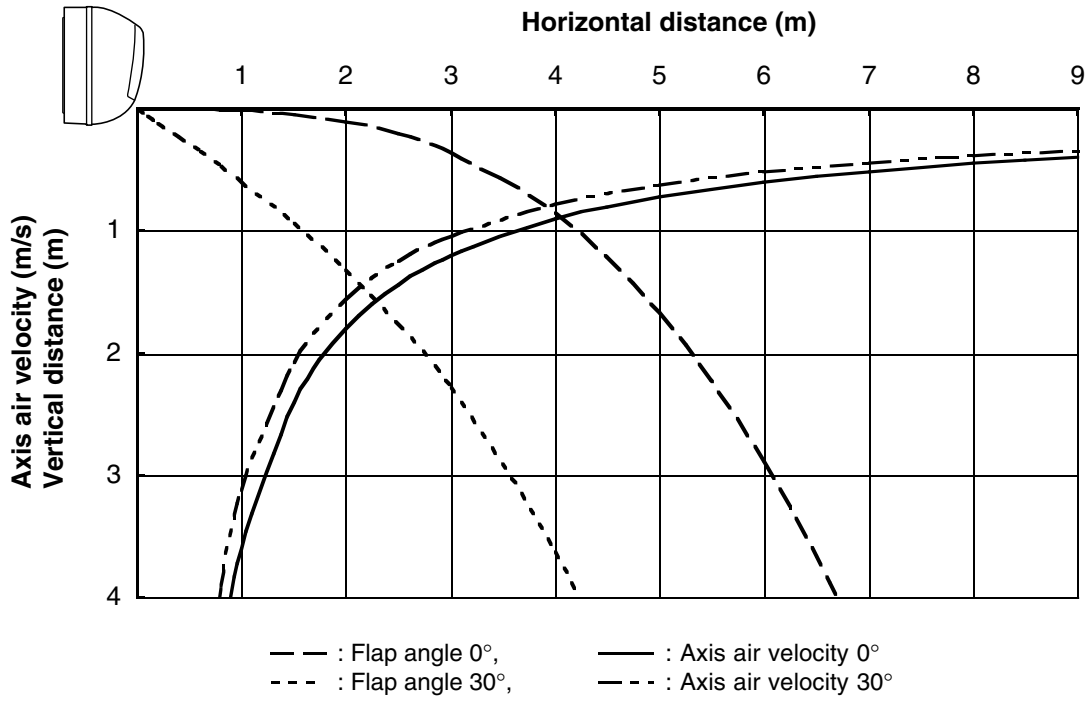
Room air temp. : 20°C
Fan speed : High



Indoor Unit **MCAF124R5IAA**

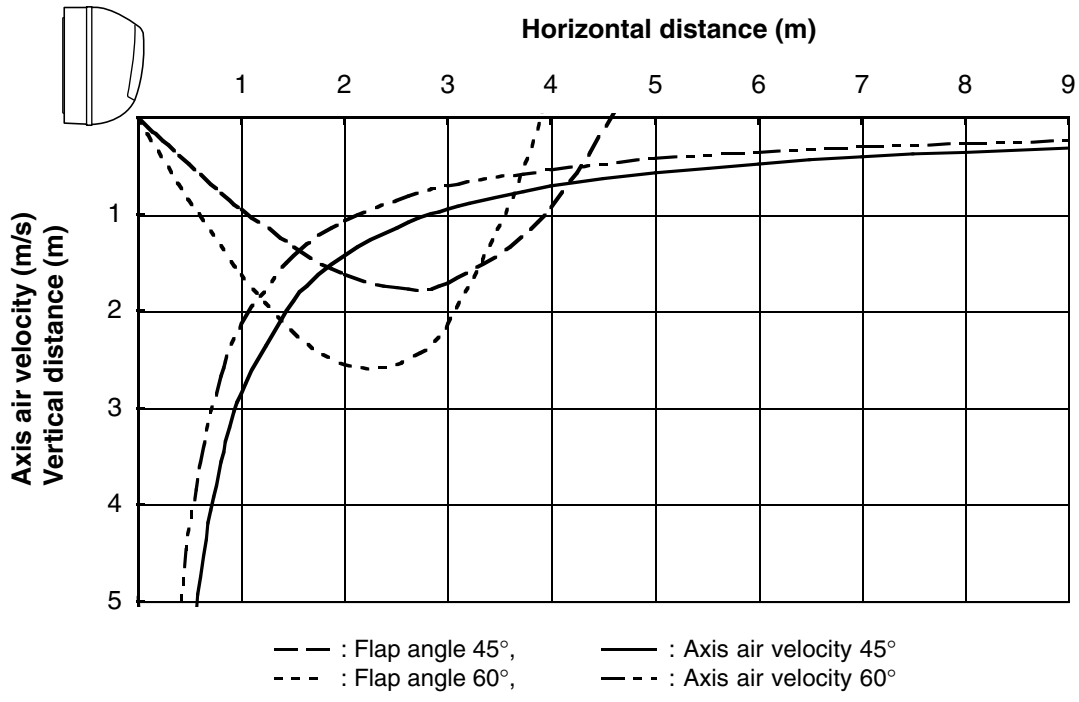
Cooling

Room air temp. : 27°C
Fan speed : High


Horizontal distance (m)
1 2 3 4 5 6 7 8 9
Axis air velocity (m/s)
Vertical distance (m)
1 2 3 4
— — : Flap angle 0°,
- - - : Flap angle 30°,
——— : Axis air velocity 0°
— - - : Axis air velocity 30°

Heating

Room air temp. : 20°C
Fan speed : High


Horizontal distance (m)
1 2 3 4 5 6 7 8 9
Axis air velocity (m/s)
Vertical distance (m)
1 2 3 4 5
— — : Flap angle 45°,
- - - : Flap angle 60°,
——— : Axis air velocity 45°
— - - : Axis air velocity 60°

6. ELECTRICAL DATA

6-1. Electrical Characteristics

Indoor Unit **MCAF94R5IAA**
Outdoor Unit **GRF97R5I**

Cooling

			Indoor Unit	Outdoor Unit	Complete Unit
			Fan Motor	Fan Motor + Compressor	
Performance at			230V Single-phase 50Hz		
Rating conditions	Running amp.	A	0.17	3.69	3.86
	Power input	W	33	722	755

Rating conditions: Indoor air temperature: 27 °C D.B. / 19 °C W.B.
Outdoor air temperature: 35 °C D.B.

Heating

			Indoor Unit	Outdoor Unit	Complete Unit
			Fan Motor	Fan Motor + Compressor	
Performance at			230V Single-phase 50Hz		
Rating conditions	Running amp.	A	0.17	4.64	4.81
	Power input	W	35	960	995

Rating conditions: Indoor air temperature 20 °C D.B.
Outdoor air temperature 7 °C D.B. / 6 °C W.B.

Indoor Unit **MCAF124R5IAA**
Outdoor Unit **GRF127R5I**

Cooling

			Indoor Unit	Outdoor Unit	Complete Unit
			Fan Motor	Fan Motor + Compressor	
Performance at			230V Single-phase 50Hz		
Rating conditions	Running amp.	A	0.17	5.04	5.21
	Power input	W	35	1,055	1,090

Rating conditions: Indoor air temperature: 27 °C D.B. / 19 °C W.B.
Outdoor air temperature: 35 °C D.B.

Heating

			Indoor Unit	Outdoor Unit	Complete Unit
			Fan Motor	Fan Motor + Compressor	
Performance at			230V Single-phase 50Hz		
Rating conditions	Running amp.	A	0.17	5.31	5.48
	Power input	W	35	1,130	1,165

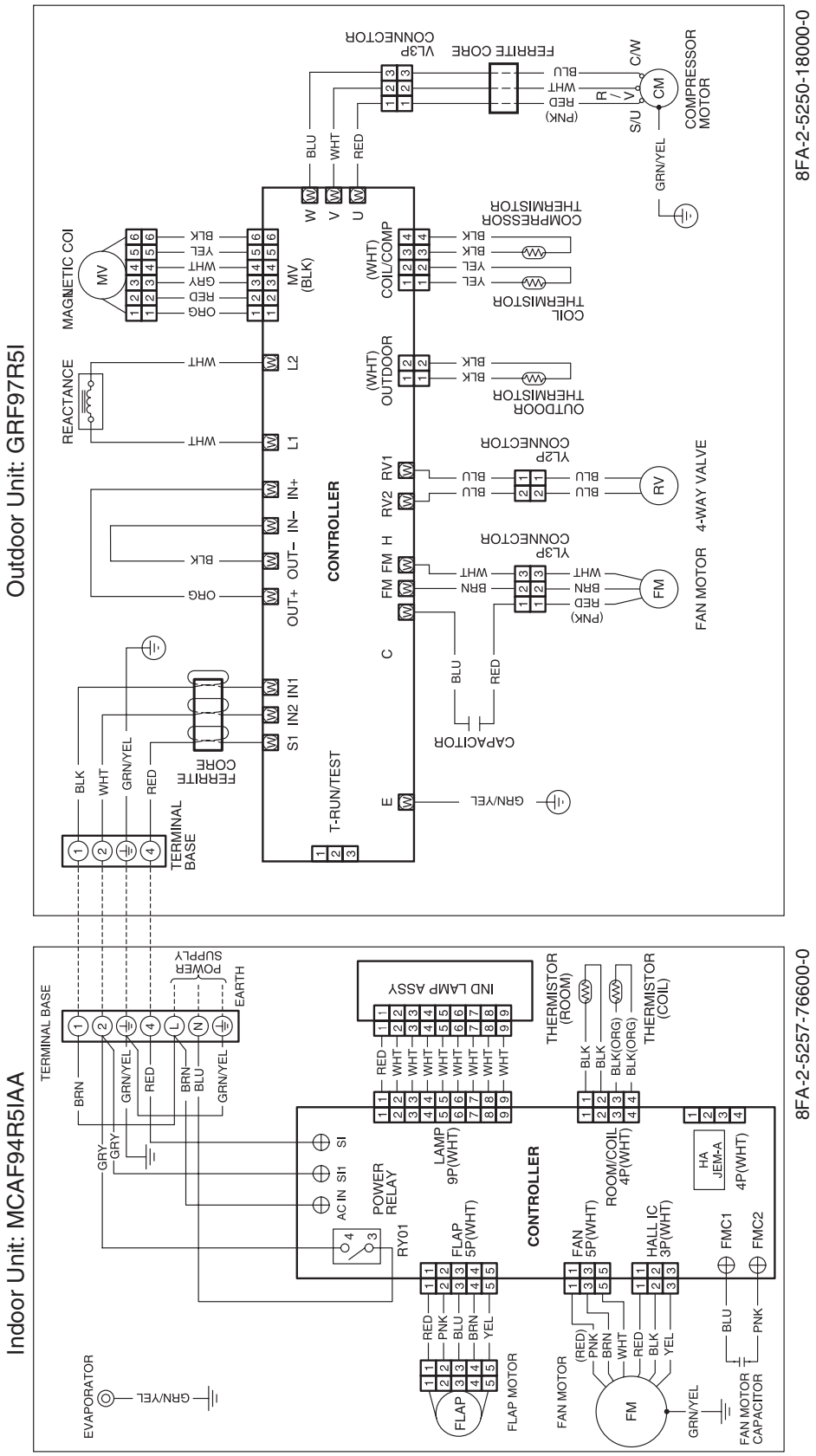
Rating conditions: Indoor air temperature 20 °C D.B.
Outdoor air temperature 7 °C D.B. / 6 °C W.B.

6-2. Electric Wiring Diagrams

Indoor Unit **MCAF94R5IAA**

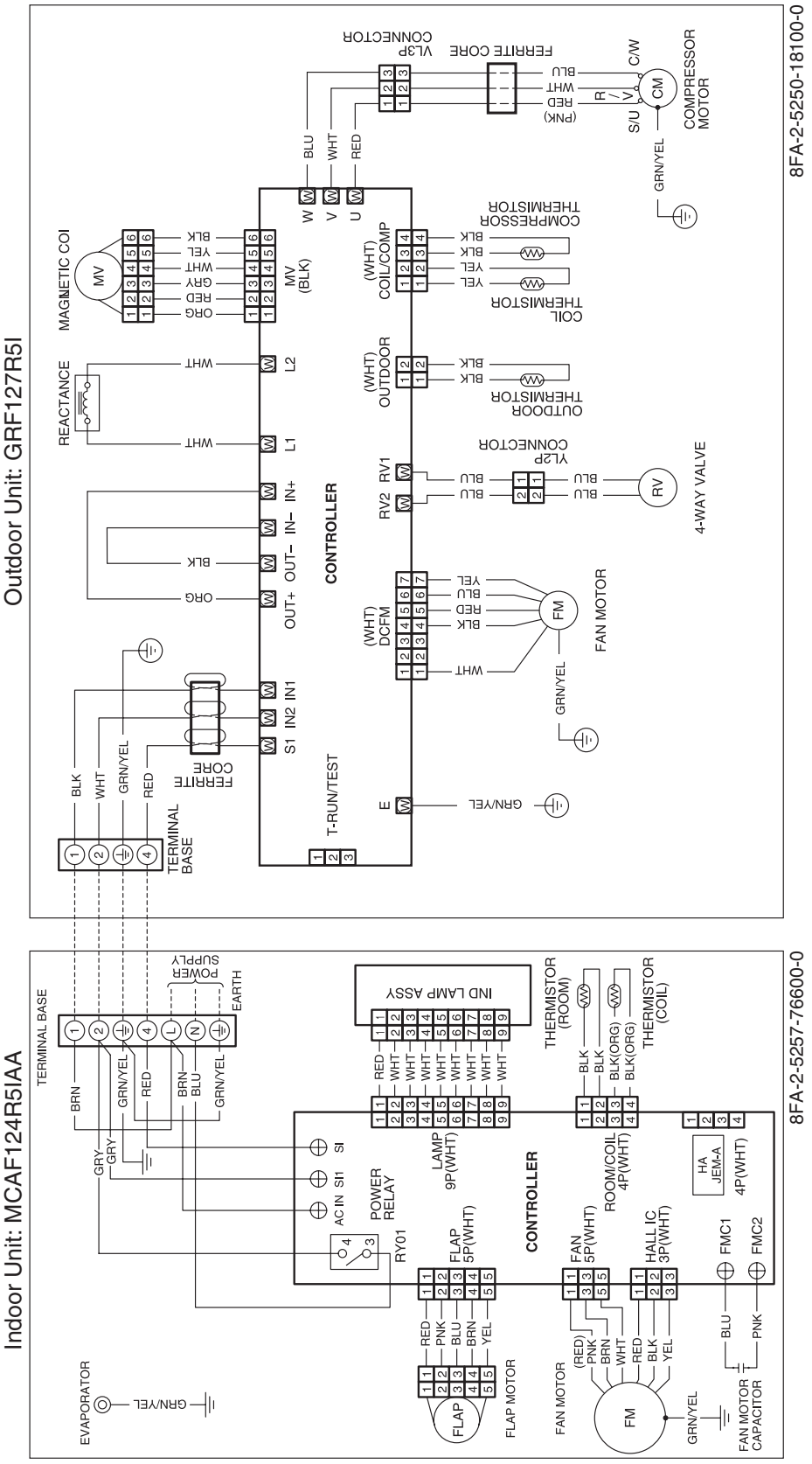
Outdoor Unit **GRF97R5I**

WARNING ***To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.***



Indoor Unit **MCAF124R5IAA**
Outdoor Unit **GRF127R5I**

WARNING ***To avoid electrical shock hazard, be sure to disconnect power before checking, servicing and/or cleaning any electrical parts.***



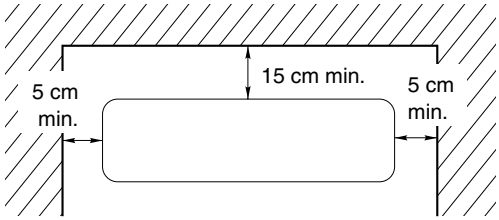
7. INSTALLATION INSTRUCTIONS

7-1. Installation Site Selection

7-1-1. Indoor Unit

WARNING

To prevent abnormal heat generation and the possibility of fire, do not place obstacles, enclosures and grilles in front of or surrounding the air conditioner in a way that may block air flow.



Front View

Fig. 1

AVOID:

- direct sunlight.
- nearby heat sources that may affect performance of the unit.
- areas where leakage of flammable gas may be expected.
- places where large amounts of oil mist exist.

DO:

- select an appropriate position from which every corner of the room can be uniformly cooled. (High on a wall is best.)
- select a location that will hold the weight of the unit.
- select a location where tubing and drain hose have the shortest run to the outside.
- allow room for operation and maintenance as well as unrestricted air flow around the unit. (Fig. 1)
- install the unit within the maximum elevation difference (H) above or below the outdoor unit and within a total tubing length (L) from the outdoor unit as detailed in Table 1 and Fig. 2.
- Install the indoor unit more than 1 meter away from any antenna or power lines or connecting wires used for television, radio, telephone, security system, or intercom. Electrical noise from any of these sources may affect operation.

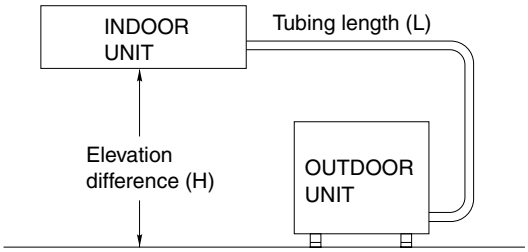


Fig. 2

CAUTION

For stable operation of the air conditioner, do not install wall-mounted type indoor units less than 1.5 m from floor level.

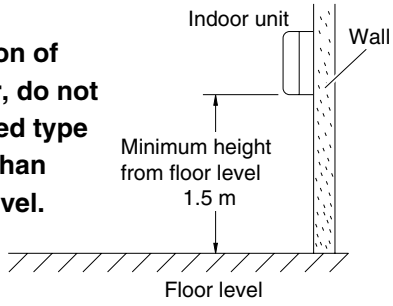


Fig. 3

Table 1

Model	Max. Allowable Tubing Length at Shipment (m)	Limit of Tubing Length (L) (m)	Limit of Elevation Difference (H) (m)	Required Amount of Additional Refrigerant (g/m)*
MCAF94 / 124	7.5	15	7	15

* If total tubing length becomes 7.5 to 15 m, charge additional refrigerant (R410A) by 15 g/m.
No additional charge of compressor oil is necessary.

7-1-2. Outdoor Unit

AVOID:

- heat sources, exhaust fans, etc. (Fig. 4)
- damp, humid or uneven locations.

DO:

- choose a place as cool as possible.
- choose a place that is well ventilated.
- allow enough room around the unit for air intake/ exhaust and possible maintenance. (Fig. 5a)
- provide a solid base (level concrete pad, concrete block, 10 × 40 cm beams or equal), a minimum of 10 cm above ground level to reduce humidity and protect the unit against possible water damage and decreased service life. (Fig. 5b)
- Install cushion rubber under unit's feet to reduce vibration and noise. (Fig. 5c)
- use lug bolts or equal to bolt down unit, reducing vibration and noise.
- Install in a location where no antenna of a television or radio exists within 3 meters.

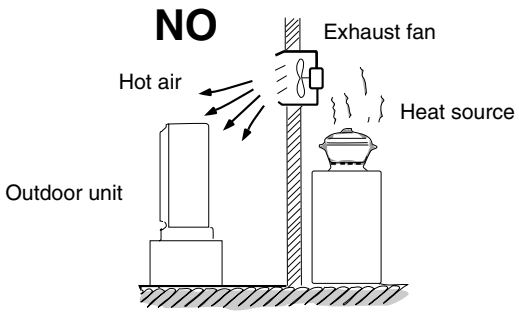


Fig. 4

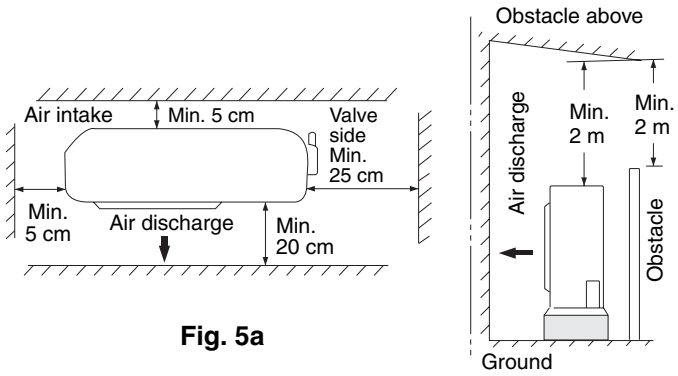


Fig. 5a

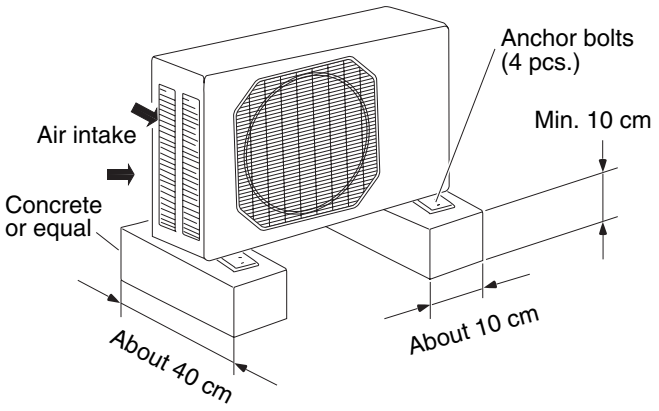


Fig. 5b

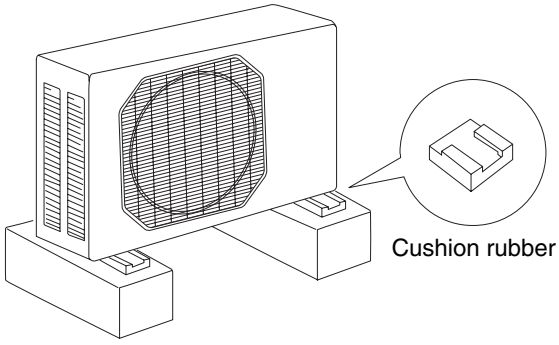


Fig. 5c

7-2. Recommended Wire Length and Diameter

Regulations on wiring diameter differ from locality to locality. For field wiring requirements, please refer to your local electrical codes. Carefully observe these regulations when carrying out the installation.
Table 2 lists recommended wire lengths and diameters for power supply systems.

NOTE

Refer to the wiring system diagram (Fig. 6) for the meaning of (A), (B) and (C) in Table 2.

Table 2

Cross-Sectional Area (mm^2) / Model	(A)+(B) (A) Power Supply Wiring Length (m) (B) Power Line Length (m)		(C) Control Line Length (m)	Fuse or Circuit Breaker Capacity
	2	3.5	2	
GRF97	40	70	20	10A
GRF127	40	70	20	

WARNING

- **Be sure to comply with local codes on running the wire from the indoor unit to the outdoor unit (size of wire and wiring method, etc.).**
- **Each wire must be firmly connected.**
- **No wire should be allowed to touch refrigerant tubing, the compressor, or any moving part.**

WARNING

- **To avoid the risk of electrical shock, each air conditioner unit must be grounded.**
- **For the installation of a grounding device, please observe local electrical codes.**
- **Grounding is necessary, especially for units using inverter circuits, in order to release charged electricity and electrical noise caused by high tension. Otherwise, electrical shock may occur.**
- **Place a dedicated ground more than 2 meters away from other grounds and do not have it shared with other electric appliances.**

CAUTION

- **Be sure to connect the power supply line to the indoor unit as shown in the wiring diagram. The outdoor unit draws its power from the indoor unit.**
- **Do not run wiring for antenna, signal, or power lines of television, radio, stereo, telephone, security system, or intercom any closer than 1 meter from the power cable and wires between the indoor and outdoor units. Electrical noise may affect the operation.**

WIRING SYSTEM DIAGRAM

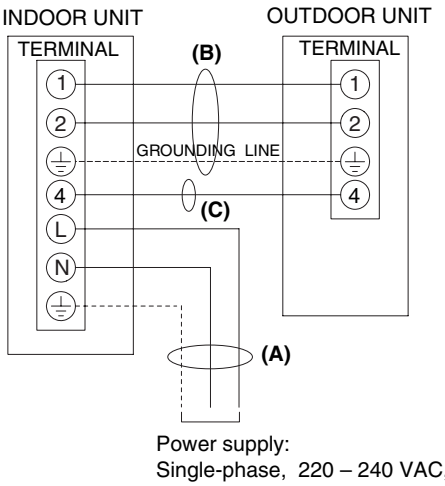


Fig. 6

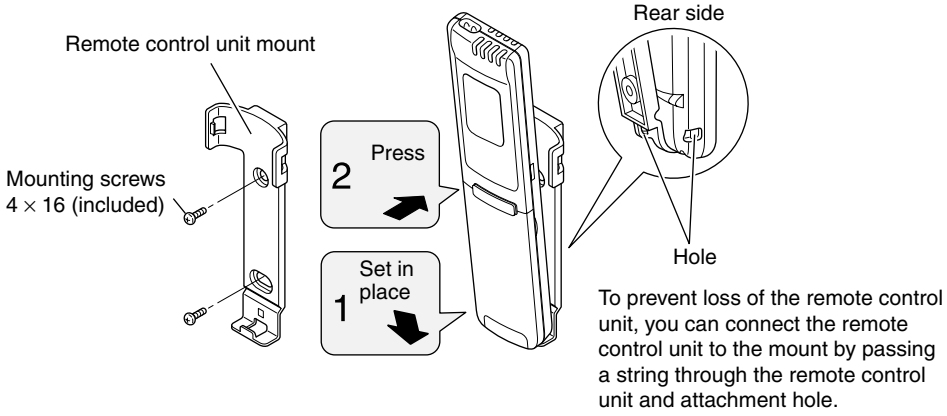
7-3. Remote Control Unit Installation Position

The remote control unit can be operated from either a non-fixed position or a wall-mounted position.
To ensure that the air conditioner operates correctly, do not install the remote control unit in the following places:

- In direct sunlight
- Behind a curtain or other place where it is covered
- More than 8 m away from the air conditioner
- In the path of the air conditioner's airstream
- Where it may become extremely hot or cold
- Where it may be subject to electrical or magnetic interference
- Where there is an obstacle between the remote control unit and the air conditioner (since a check signal is sent from the remote control unit every 5 minutes)

7-3-1. Mounting on a Wall

Before mounting the remote control unit, press the ON/OFF operation button at the mounting location to make sure that the air conditioner operates from that location. The indoor unit should make a beeping sound to indicate that it has received the signal.


Remote control unit mount
Mounting screws
4 × 16 (included)
2
Press
1
Set in place
Rear side
Hole
To prevent loss of the remote control unit, you can connect the remote control unit to the mount by passing a string through the remote control unit and attachment hole.

To take out the remote control unit, pull it forward.

Fig. 7

7-4. How to Test Run the Air Conditioner

After turning on power to the air conditioner, use the remote controller and follow the steps below to conduct the test run.

(1) Set the remote controller in Test Run mode. (Fig. 8a)
   a) Press and hold the QUIET button.
   b) Then press and hold the 1HR TIMER button.
   c) At the same time, press the ACL (reset) button once. Use a pointed object such as the tip of a pen to press the ACL button.
   - After a few seconds, " ❄ " appears and "oP-1" blinks in the remote controller display area. (Fig. 8b)

   d) Release the 1HR TIMER button.
   e) Release the QUIET button.

(2) Start Cooling mode test run by pressing the ON/OFF operation button of the remote controller. (Fig. 8a)
   - This starts the fan producing uncooled forced air with the 3 indicator lamps (OPERATION lamp, TIMER lamp and QUIET lamp) on the main unit blinking. (Fig. 8c)
   - After 3 minutes, the system shifts into cooling operation, and cool air will start to be felt. Cool mode test run is unaffected by the room temperature.

(3) Press the ON/OFF operation button of the remote controller again to stop the test run. (Fig. 8a)

(4) Finally press the ACL (reset) button of the remote controller to release it from Test Run mode to return to normal mode. (Fig. 8a)
   - " ❄ " and "oP-1" will disappear from the remote controller display area.

IMPORTANT

After the test run is completed, be sure to press the ACL (reset) button to return to normal mode. The air conditioner will not operate correctly if this is not done.

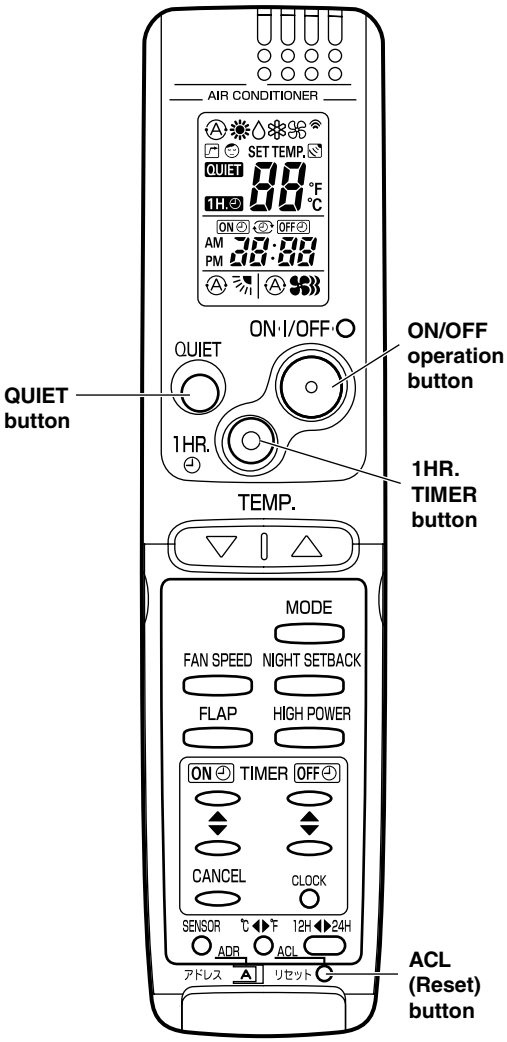


Fig. 8a

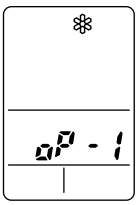


Fig. 8b

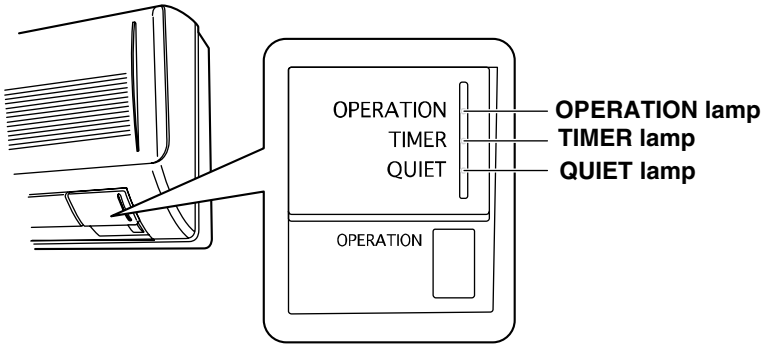


Fig. 8c

7-5. Remove the Grille to Install the Indoor Unit

Basically, these models can be installed and wired without removing the grille. If access to any internal part is needed, follow the steps as given below.

CAUTION

Be sure to wear work gloves during installation to avoid being cut by the sharp aluminum fins of the heat exchanger.

How to remove the grille

(1) Grasp both ends of the air intake grille, and remove it by opening towards the front and pulling towards you. (Fig. 9a)
(2) Remove the 2 screws. (Fig. 9b)
(3) Remove the screw on the right side cover plate and open the cover. (Fig. 10a)
(4) Take out the thermistor from the grille. (Fig. 10b)
(5) Pull the lower part of the grille toward you to remove. (Fig. 11a)
(6) Use a standard screwdriver to push on the tabs to remove the grille.

How to replace the grille

(1) Reinstall the grille into the lower part while aligning its tabs on the upper part. (Fig. 11b)
Insert the tabs in the slots and push the lower part of the grille back into position.
(2) Make sure that the grille and frame are firmly fitted together by engaging the tabs.
(3) Attach the thermistor on the grille. (Fig. 10a)
(4) Close the cover and replace the screw. (Fig. 10a)
(5) Affix the grille with the 2 previously removed screws. (Fig. 9b)
(6) Install the air intake grille.
(a) Allow the edge of the air intake grille to slide into the top of the indoor unit, and then insert it all the way inside. (Fig. 12a)
(b) Press the bottom right and left corners and center of the air intake grille to attach it to the indoor unit. (Fig. 12b)

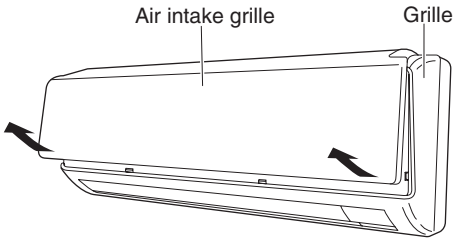


Fig. 9a

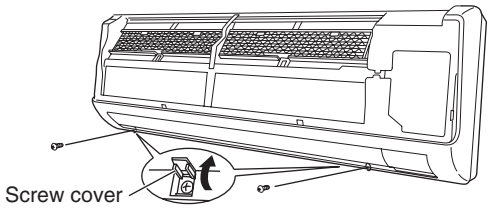


Fig. 9b

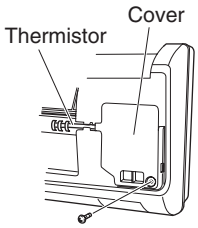


Fig. 10a

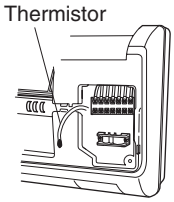


Fig. 10b

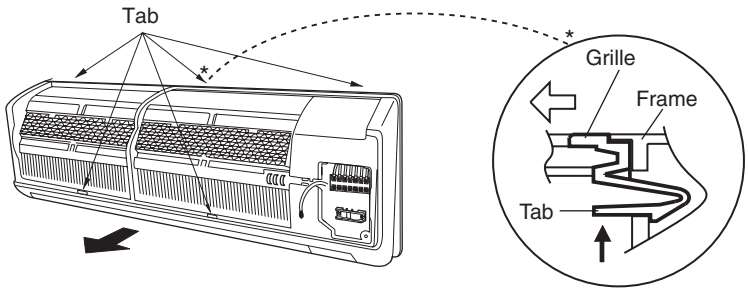


Fig. 11a

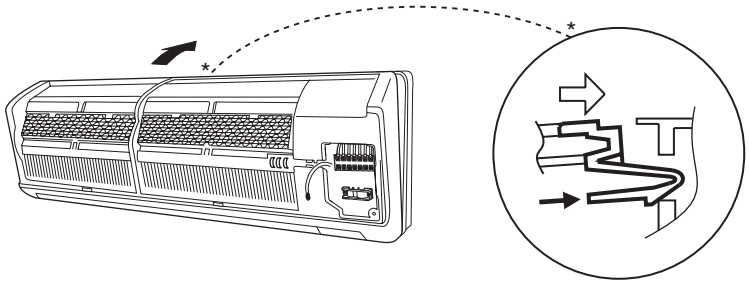


Fig. 11b

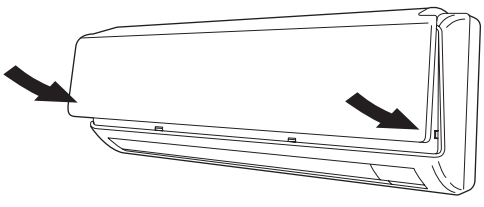


Fig. 12b

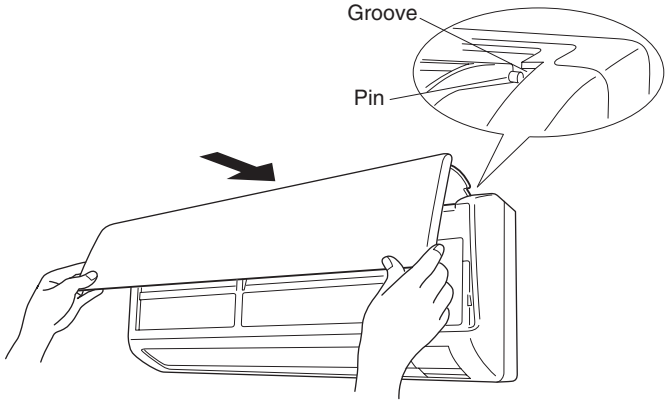


Fig. 12a

8. MAINTENANCE

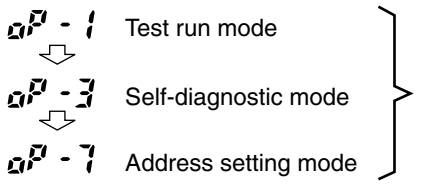
8-1. Address Setting of the Remote Control Unit

The address can be set in order to prevent interference between remote controllers when two indoor units are installed near each other. The address is normally set to "A." To set a different address, it is necessary to change the address on the second remote controller.

NOTE

Once changed, you cannot restore the original address setting of the air conditioner.

(1) Switch on the power source.
(2) Break the address-setting tab marked "A" on the second remote controller to change the address (Fig. 13). When the tab is removed, the adress is automatically set to B (Fig. 14).
(3) Press and hold the remote controller QUIET button and 1 HR TIMER button. At the same time, press the ACL(reset) button. Use a thin object such as the tip of a pen to press the ACL button. When this has been done, "oP-1" (test run) appears, blinking, in the remote controller clock display area.
(4) Each time the 1 HR TIMER button is pressed, the display changes as shown below. Press this button 2 times to change the display to "oP-7" (address setting). (Fig. 15)



(5) "oP-7" has now been selected for address setting.
(6) Press the ON/OFF operation button on the remote controller. (Fig. 15) Check that the "beep" signalreceived sound is heard from the second indoor unit (approximately 5 times). The sound you hear is the signal that the remote controller address has been changed.
(7) Finally press the remote controller ACL (reset) button to cancel the blinking "oP-7" display. (Fig. 15)

Changing of the second remote controller address is now completed.

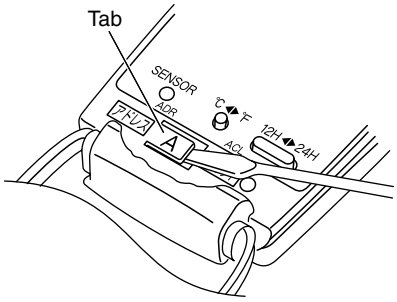


Fig. 13

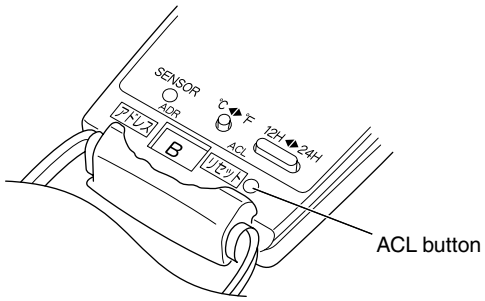


Fig. 14

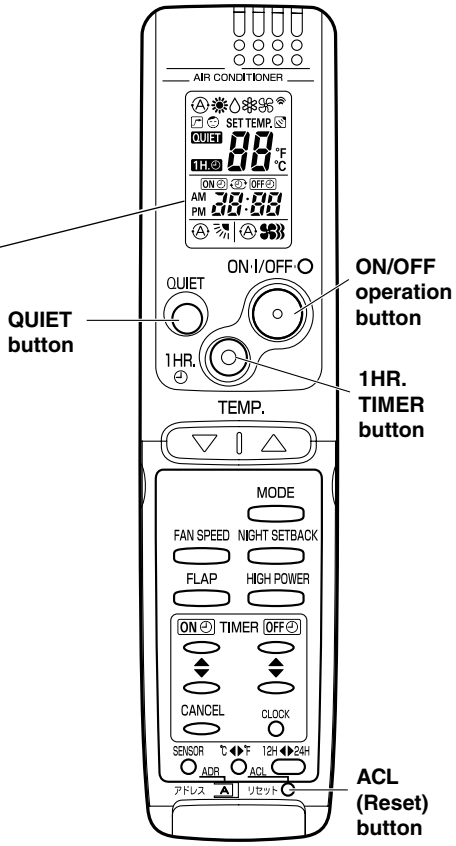
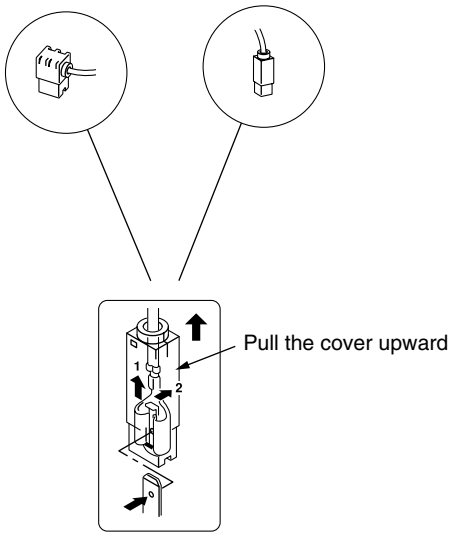


Fig. 15

8-2. Disconnecting and Connecting Positive Connector for Outdoor Unit



When the cover is pulled upward, the lock is released with the sequence of 1 and 2.

One of the two types of connectors illustrated at left is used. Their basic structure is the same for each.

How to Disconnect

Hold the resin connector cover, and pull the connector off. You cannot disconnect the connector by pulling the wire since it is locked inside. Always hold the cover to disconnect. (See illustration at left.) For the connector without the resin cover, push the lock in the direction of "2" while pulling it off.

How to Connect

In order to connect, hold the resin cover of the connector and push it in. Confirm the click sound for the inside lock.

9. FUNCTIONS

9-1. Operation Functions

■ Emergency operation

Emergency operation is available when the remote controller malfunctions, has been lost, or otherwise cannot be used.

To operate the system, press the OPERATION button, which is also used as the receiver, below the unit display. Each time this button is pressed, the OPERATION lamp changes color to indicate the type of operation. Select the desired type of operation.

COOL (GREEN) → **HEAT** (RED) → **STOP** (Lamp Off)

- The set temperature is 2 °C below the detected room temperature in the case of cooling operation, and 2 °C above the room temperature in the case of heating operation. The flap and fan speed settings are AUTO.

■ AUTO cooling/heating operation

● Selecting the operation mode

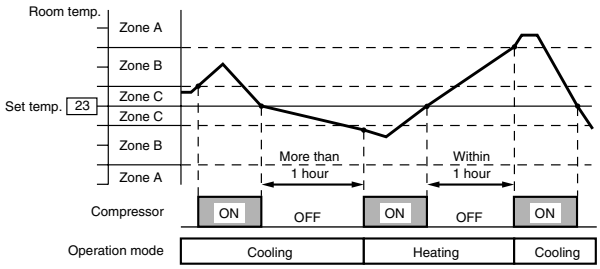
- When AUTO mode is selected, the microprocessor calculates the difference between the set temperature and the room temperature, and automatically switches to Cooling or Heating mode.

  Room temp. ≥ Set temp. → COOL
  Room temp. < Set temp. → HEAT

- As shown by the example in the figure below, with AUTO cooling / heating operation, the mode changes between Heating and Cooling mode according to changes in the relationship between the current room temperature and the set temperature.

Example

Example of operation in AUTO mode with the set room temperature at 23 °C.

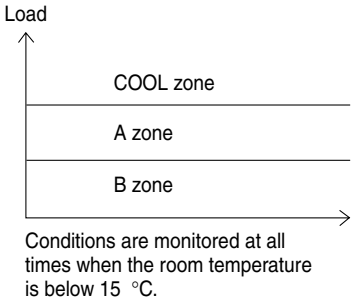


■ SENSOR DRY

During DRY operation, the system adjusts the room temperature and fan speed according to the conditions in the room, in order to maintain a comfortable room environment.

SENSOR DRY operation

- DRY operation is as shown in the figure below.



Conditions are monitored at all times when the room temperature is below 15 °C.

DRY A

The compressor operation frequency varies.
The indoor fan operates with 1/f fluctuation.

DRY B

The compressor operates at a low operating frequency.
The indoor fan operates with 1/f fluctuation.

Monitor

- Monitoring operation takes place when the room temperature is below 15 °C, or more than 3 °C below the set temperature.
- When the monitoring range is entered, the compressor stops, and the indoor fan operates with 1/f fluctuation.

■ PAM-α control

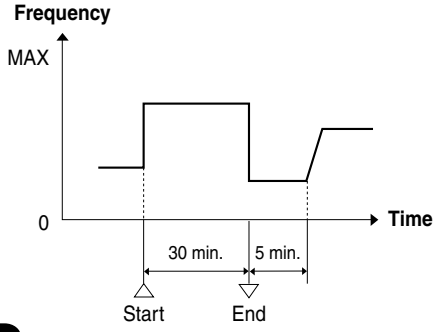
- In order to further improve inverter performance, control is switched between PWM control at low operation speeds, and PAM control at high operation speeds, making the most effective use of power.

■ HIGH POWER

This function acts to raise the power but keeps the AC system in the same operating mode.
This function is set with the HIGH POWER button on the remote controller.
(It can be set regardless of the temperature and fan speed settings.)

● HIGH POWER operation from remote controller

The unit operates at maximum output for 30 minutes, regardless of the desired temperature.
The fan speed is 1 step above "High."



NOTE

- When HIGH POWER operation ends, the unit operates at low Hz for 5 minutes, regardless of the thermostat OFF conditions.
- When in DRY mode, operation is in the cooling zone.

■ Lamp colors

OPERATION lamp	
HEAT operation	Red
DRY operation	Orange
COOL operation	Green
FAN operation	Green
DEFROSTING operation	Red and Orange alternately
TIMER lamp	Green
QUIET lamp	Green

■ Timer backup

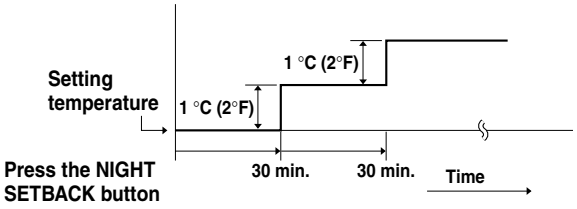
- Operation stops if there are no operator controls for 25 hours or longer after unit operation switched from OFF to ON by use of ON timer operation.

■ NIGHT SETBACK

- When NIGHT SETBACK operation is set, the temperature and fan speed settings will be adjusted automatically to allow comfortable sleep.
- When NIGHT SETBACK operation is set, "mark" appears on the remote controller. The main unit display lamp also becomes dimmer.

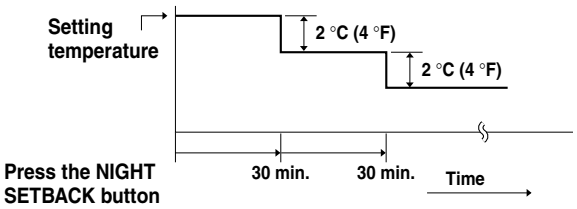
● COOL and DRY modes

When the night setback mode is selected, the air conditioner automatically raises the temperature setting 1 °C when 30 minutes have passed after the selection was made, and then another 1 °C after another 30 minutes have passed, regardless of the indoor temperature when night setback was selected. This enables you to save energy without sacrificing comfort. This function is convenient when gentle cooling is needed.



● HEAT mode

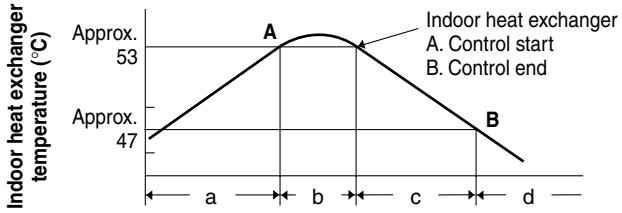
When the night setback mode is selected, the air conditioner automatically lowers the temperature setting 2 °C when 30 minutes have passed after the selection was made, and then another 2 °C after another 30 minutes have passed, regardless of the indoor temperature when night setback was selected. This enables you to save energy without sacrificing comfort. This function is convenient when gentle heating is needed.



9-2. Protective Functions

■ Overload prevention during heating

During HEAT operation, the temperature of the indoor heat exchanger is used to control the frequency and lessen the load on the compressor before the protective device is activated.

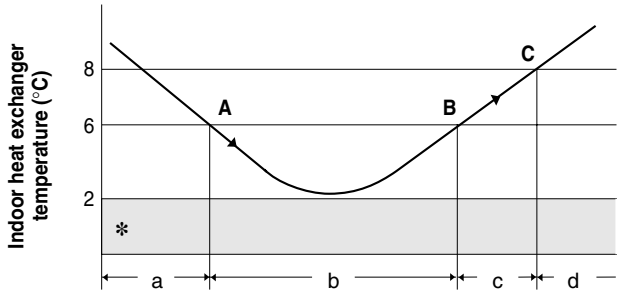


a. Area: Automatic capacity control
b. When Point A has been exceeded, the operation frequency is reduced by a certain proportion.
c. Area: Frequency increase is prohibited.
d. At Point B and below, overload prevention is ended and control is the same as in the a area.

■ Freeze prevention

During COOL or DRY operation, freezing is detected and operation is stopped when the temperature of the indoor heat exchanger matches the conditions below.

1. Freeze-prevention operation is engaged when the temperature of the indoor heat exchanger is below 6 °C.
2. Restart after freeze-prevention operation occurs when the temperature of the indoor heat exchanger reaches 8 °C or above.

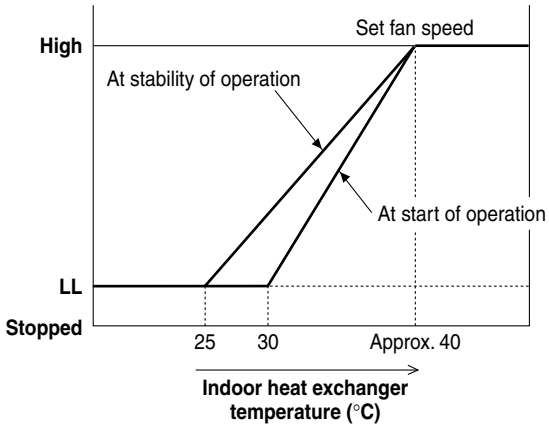


a. Area: Automatic capacity control
b. When the temperature drops below Point A, the operation frequency is reduced by a certain proportion.
c. Area: Frequency increase is prohibited.
d. When the temperature reaches Point C or above, freezing prevention is ended and control is the same as in the a area.

* When the temperature drops to below 2 °C (continuously for 2 minutes or longer), the compressor stops.
Once the freeze condition is detected, the air conditioner will work less than the maximum frequency until it is turned off.

■ Cold-air prevention during heating

During heating, the fan speed is set to "LL" (very low) or stopped. As the temperature of the indoor heat exchanger rises, the fan speed is changed to the set speed.

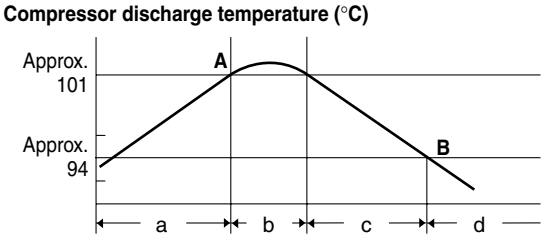


NOTE

- The fan speed is forcibly changed to "LL" beginning 30 seconds after the thermostat turns OFF.
- At stability of operation refers to operation when the room temperature has approached the set temperature.
- When HEAT operation starts, the indoor fan is stopped until the temperature of the indoor heat exchanger reaches 20 °C or higher, or until the room temperature reaches 15 °C or higher.

■ Compressor discharge temperature control

This function controls the operation frequency to prevent the compressor discharge temperature from rising more than a specified temperature.



a. Area: Automatic capacity control.
b. When the temperature rises above Point A, the operation frequency is reduced at a specified rate.
c. Area: Further frequency increase is prohibited.
d. When the temperature falls below Point B, prevention of a rise in frequency is released and the air conditioner operates as in a area.

* The compressor will stop if the temperature of the compressor discharge exceeds 120 °C due to shortage of gas or other reason.

■ Defrost detection and release

● **Reverse-Cycle Defrosting**

Defrosting Sequence

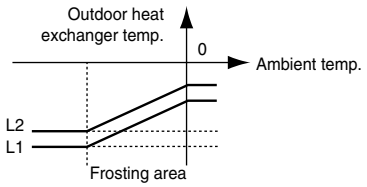
Heating operation

- Outdoor fan ON
- 4-way valve ON

Frost sensing

Defrost detection occurs in either of the following cases:

- The temperature of the heat exchanger remains at or below the L1 line for 3 minutes after the start of HEAT operation.
- The temperature of the heat exchanger remains at or below the L2 line for 120 minutes after the start of HEAT operation.



Reverse-cycle defrosting operation

- Compressor ➞ 1 minute after it is stopped, compressor is ON.
- Outdoor fan ➞ OFF
- Indoor fan ➞ OFF
- 4-way valve ➞ OFF
- Operation lamp ➞ Repeatedly switches between red and orange illumination.

Releasing of defrosting

- Outdoor heating exchanger temp. is over 20 °C.
- Defrosting operation lasts 12 minutes (maximum). 2 minutes after it is stopped, compressor is ON. 4-way valve is ON. Outdoor fan is ON.

NOTE

If the air conditioner is turned off during the defrosting cycle, it will continue defrosting and turn itself off after defrosting is completed.

■ CT (Peak current cut-off control)

- This function prevents the circuit breaker or fuse from operating to open the circuit. This function works when electrical current has increased due to an increase in the cooling / heating load, or to a decrease in the power supply voltage. In these cases, operation frequency is reduced or operation is interrupted automatically to control the electrical current for operation.
- When the cause of the increase in electrical current is rectified, the system will resume operation in the original mode.

(A)

	Cooling • Dry	Heating
Peak current cut-off trips	12.0	
Hz down	8.5	8.5

NOTE Electrical current setting for COOL operation is used during DEFROST operation.

10. TROUBLESHOOTING

10-1. Precautions before Performing Inspection or Repair

- After checking the self-diagnostics monitor, turn the power OFF before starting inspection or repair.
- High-capacity electrolytic capacitors are used inside the outdoor unit controller (inverter). They retain an electrical charge (charging voltage DC 310V) even after the power is turned OFF, and some time is required for the charge to dissipate. Be careful not to touch any electrified parts before the controller LED (red) turns OFF.

  If the outdoor controller is normal, approximately 30 seconds will be required for the charge to dissipate. However, allow at least 5 minutes for the charge to dissipate if there is thought to be any trouble with the outdoor controller.

10-2. Method of Self-Diagnostics

Follow the procedure below to perform detailed trouble diagnostics.

NOTE

1: If the operation lamp blinks every 0.5 seconds immediately when the power is turned ON, there is an external ROM (OTP data) failure on the indoor circuit board, or a ROM socket insertion problem, or the ROM has not been installed.

2: The failure mode is stored in memory even when the power is not ON. Follow the procedure below to perform diagnostics.

PROCEDURE

After turning on power to the air conditioner, use the remote controller and follow the steps below to execute self-diagnostics.

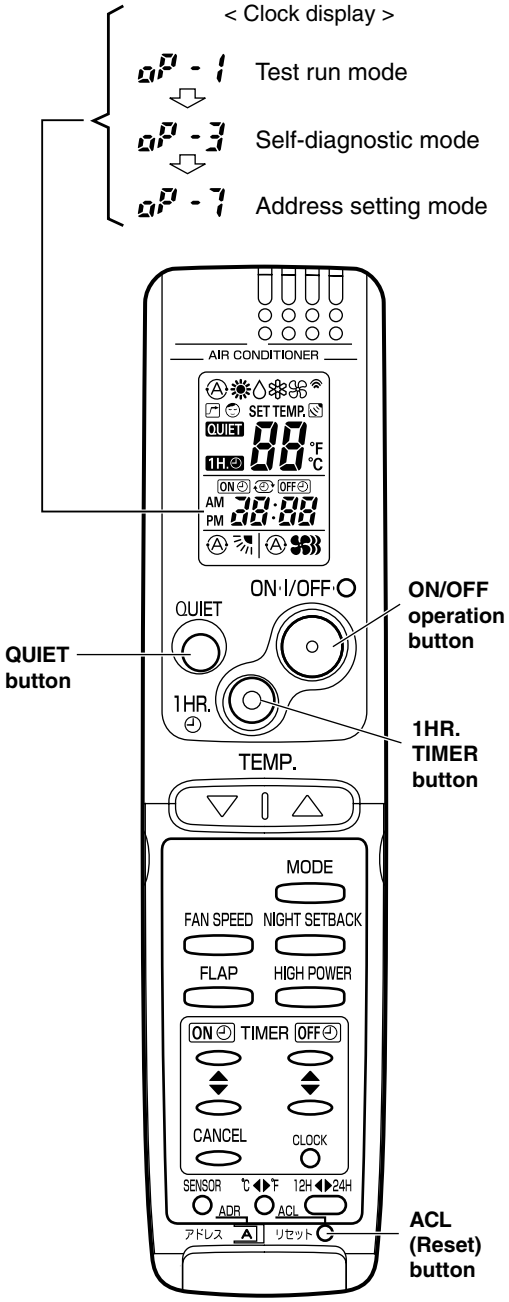
Step 1: Press and hold the remote controller QUIET button and 1 HR TIMER button. At the same time, press the ACL (reset) button. Use a pointed object such as the tip of a pen to press the ACL button.
When this has been done, "oP-1" (test run) appears, blinking, in the remote controller clock display area.

Step 2: Next, press the 1 HR TIMER button once to change the display from "oP-1" to "oP-3" (self-diagnostics). (The display continues to blink.)

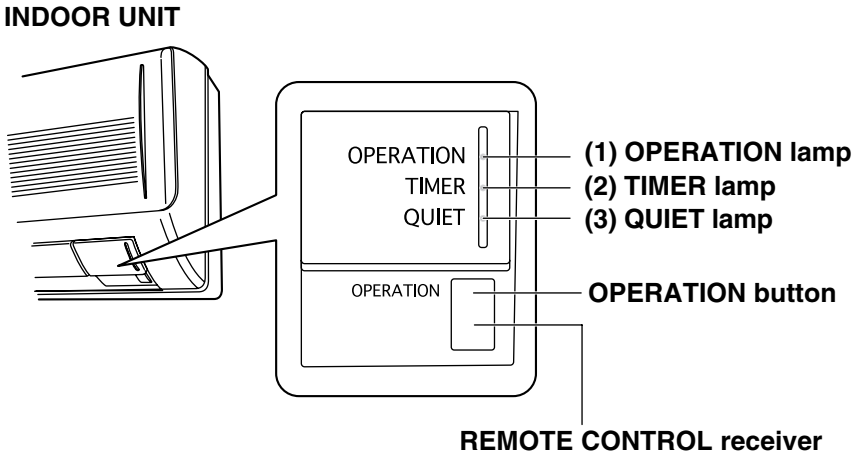
Step 3: Finally press the ON/OFF button to engage self-diagnostics mode.

- The self-diagnostics function utilizes the 3 indicator lamps on the main unit, in combinations of ON lamps, blinking lamps, and OFF lamps, to report the existence of sensor trouble or a protective operation. (The lamps blink or remain ON for 5 seconds, then turn OFF for 2 seconds.) Self-diagnostics is completed when the buzzer sounds 3 short beeps.
- A maximum of 3 self-diagnostics reports are displayed, for 5 seconds each, beginning with the most recent report. Following this display the lamps turn OFF. In order to view the self-diagnostics results again, press the ON/OFF button again.
- The 3 lamps remain OFF if no trouble has occurred.

<IMPORTANT> After self-diagnostics is completed, be sure to press the ACL (reset) button to return to normal mode. The air conditioner will not operate if this is not done.



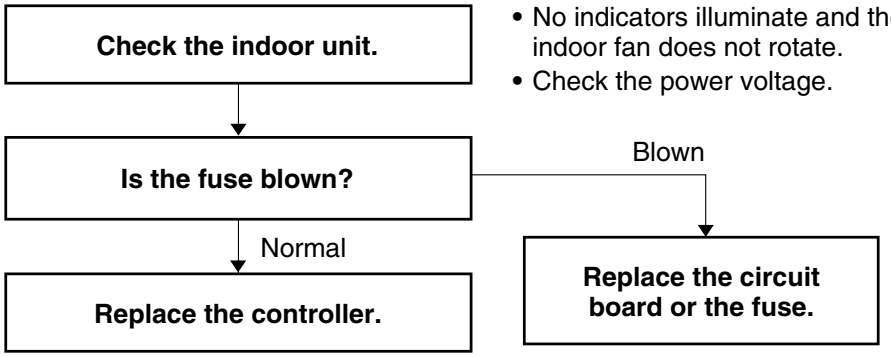
(1) Self-diagnostics Lamps



• Since the indications cover various units, the corresponding parts listed below may not be present in some models.

Indication on indoor unit				✕ ···· OFF ◑ ···· Blinking ☼ ···· ON (Illuminated)	
Quiet (3)	Timer (2)	Operation (1)	Code	Diagnostics item	Diagnostics contents
✕	✕	◑	S01	Room temperature sensor failure	(1) Sensor open circuit or short circuit (2) Contact failure at connector or open circuit at terminal crimping location (short-circuit detection only for the humidity sensor) (3) Indoor/outdoor circuit board failure
✕	◑	✕	S02	Indoor heat exchanger sensor failure	
✕	◑	◑	S03	Humidity sensor failure	
◑	✕	✕	S04	Compressor temperature sensor failure	(1) Sensor open circuit or short circuit (2) Contact failure at connector or open circuit at terminal crimping location (3) Outdoor circuit board failure
◑	✕	◑	S05	Outdoor heat exchanger sensor failure	
◑	◑	✕	S06	Outdoor air temperature sensor failure	
◑	◑	◑	S07	Outdoor electrical current detection failure	Outdoor circuit board failure
✕	✕	☼	E01	Indoor/outdoor communications failure (serial communications)	(1) Mis-wiring (2) AC power failure (3) Blown fuse (4) Power relay failure (5) Indoor or outdoor circuit board failure
✕	☼	✕	E02	• HIC circuit failure • Power Tr (transistor) circuit failure	(1) HIC or power Tr failure (2) Outdoor fan does not turn. (3) Instantaneous power outage (4) Service valve not opened. (5) Outdoor fan blocked. (6) Continuous overload operation (7) Compressor failure (8) Outdoor circuit board failure
✕	☼	☼	E03	Outdoor unit external ROM (OTP data) failure	(1) External ROM data failure (2) Outdoor circuit board failure
☼	✕	✕	E04	Peak current cut-off	(1) Instantaneous power outage (2) HIC or power transistor failure (3) Outdoor circuit board failure
☼	✕	☼	E05	• PAM circuit failure • Active circuit failure	(1) Outdoor circuit board failure (2) Outdoor power supply voltage failure
☼	☼	✕	E06	Compressor discharge overheat prevention activated.	(1) Electric expansion valve failure (2) Capillaries choked (3) Shortage of refrigerant (4) Continuous overload operation (5) Outdoor fan does not rotate (6) Outdoor circuit board failure
☼	☼	☼	E07	Indoor fan operating failure	(1) Fan motor failure (2) Contact failure at connector (3) Indoor circuit board failure
◑	◑	☼	E08	• 4-way valve switching failure • Indoor zero-cross failure	(1) 4-way valve failure (heat pump model only) (2) Outdoor circuit board failure
◑	☼	◑	E09	No-refrigerant protection	(1) Service valve not opened. (2) Shortage of refrigerant
◑	☼	☼	E10	DC compressor drive circuit failure	(1) Open phase (2) Outdoor circuit board failure
☼	◑	◑	E11	Outdoor fan operating failure	(1) Fan motor failure (2) Contact failure at connector (3) Outdoor circuit board failure
☼	◑	☼	E12	• Outdoor system communications failure • Outdoor high-pressure SW • OLR operation • Outdoor power supply open phase • Outdoor coil freezing	(1) Mis-wiring (2) Blown fuse (3) Power relay failure (4) Open phase (5) Outdoor circuit board failure (6) Compressor failure
☼	☼	◑	E13	Freeze-prevention operation activated.	(1) Indoor fan system failure (2) Shortage of refrigerant (3) Low-temperature operation

(2) If the self-diagnostics function fails to operate


Check the indoor unit.
• No indicators illuminate and the indoor fan does not rotate.
• Check the power voltage.
Is the fuse blown?
Blown
Normal
Replace the controller.
Replace the circuit board or the fuse.

10-3. Checking the Indoor and Outdoor Units

(1) Checking the indoor unit

No.	Control	Check items (unit operation)
1	Use the remote controller to operate the unit in "TEST run" mode. To determine whether the mode is currently in "TEST run" mode, check the 3 indicator lamps on the unit. If all 3 are blinking, the current mode is "TEST run."	• The rated voltage must be present between inter-unit wirings 1 and 2. • Connect a 5 k ohm resistor between inter-unit wirings 2 and 3. When the voltage at both ends is measured, approximately 12 to 15V DC must be output and the multimeter pointer must bounce once every 8 seconds. Or instead of measuring the voltage, you can insert an LED jig and check that the LED flickers once every 8 seconds.

- If there are no problems with the above, then check the outdoor unit.
- For the "Test run" procedure, refer to 7.4" How to Test Run the Air Conditioner".

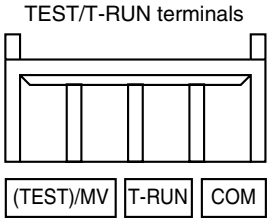
(2) Checking the outdoor unit

No.	Control	Check items (unit operation)
1	Apply the rated voltage between outdoor unit terminals 1 and 2.	• The control panel LED (red) must illuminate.
2	Short-circuit the outdoor unit COM terminal to the T-RUN terminal.	• The compressor, fan motor, and 4-way valve must all turn on.

- If there are no problems with the above, then check the indoor unit.

● Using the TEST/T-RUN terminals

T-RUN : Test run (compressor and fan motor turn ON).
TEST/MV : Compresses time to 1/60th (accelerates operation by 60 times faster than normal).



(3) Checking the serial communications

→ Control 1 → Control 2 ⨯ ···· **OFF** ◑ ···· **Blinking** ☼ ···· **Illuminated**

Initial self-diagnostics			Short-circuit terminals 2 and 3 on the indoor unit terminal plate.			Short-circuit terminals 2 and 3 on the outdoor unit terminal plate.			Probable location of malfunction
Quiet (3)	Timer (2)	Operation (1)	Quiet (3)	Timer (2)	Operation (1)	Quiet (3)	Timer (2)	Operation (1)	
⨯	⨯	☼	⨯	⨯	☼	—	—	—	Indoor unit circuit board failure
			☼	◑	☼	☼	◑	☼	Outdoor unit circuit board failure
			☼	◑	☼	⨯	⨯	☼	Failure (open circuit, contact failure, etc.) in the inter-unit wirings
☼	◑	☼	—	—	—	—	—	—	Outdoor unit circuit board failure

- Turn the power OFF before performing short circuiting procedures.
- Refer to the previous pages when performing system self-diagnostics.
- So that the check can be made quickly, indicators blink at first communication after power ON.
- Before performing the above checks, perform “TEST run” operation, and check that the rated voltage is output to terminals 1 and 2 on the outdoor unit. If it is not output, there is a failure related to the indoor unit power.

10-4. Trouble Diagnosis of Fan Motor

10-4-1. Outdoor Fan Motor (Only for GRF127R5I)

- This outdoor DC fan motor contains an internal control PCB. Therefore, it is not possible to measure the coil resistance, and the following procedure should be used to check the motor.
- Perform the trouble diagnosis by Test Run mode described on Installation Instructions.

Important: (A) Turn OFF the power before connecting or disconnecting the motor connectors.
(B) When performing voltage measurement at the outdoor controller connector for (3) in the table below, the DC motor will trip and voltage output will stop approximately 10 seconds after operation is started. For this reason, to measure the voltage again, first turn OFF the outdoor unit power, then, measure the voltage in Test Run mode.

[Trouble symptom 1] The fan does not stop when the outdoor unit stops. ➞Outdoor unit controller trouble

[Trouble symptom 2] The fan motor does not rotate when the outdoor unit is operating.

(Diagnostic procedure)

* Disconnect the motor connectors and measure the voltage at the DC motor connectors on the outdoor unit controller (3 locations).

Measurement location	Normal value
(1) Vs-Gnd : Between pin 1 and pin 4	DC 230V or more
(2) Vcc-Gnd : Between pin 5 and pin 4	DC 14V or more
(3) Vsp-Gnd : Between pin 7 and pin 4	After fluctuating 4 times between DC 1.7 to 6.1V (1 sec. ON) and DC 0 V (1 sec. OFF), the DC motor trips.

(Diagnostic results)

All of the above measured values are normal. ➞Fan motor trouble (Replace the motor.)
Any one of the above measured values is not normal. ➞Outdoor unit controller trouble (Replace the controller .)

(Reference) DC motor connector pin arrangement

Pin 1: Vs (white)
Pin 2: Not used
Pin 3: Not used
Pin 4: Gnd (black)
Pin 5: Vcc (red)
Pin 6: FG (blue)
Pin 7: Vsp (yellow)

[Trouble symptom 3] Motor rotates for some time (several seconds), but then quickly stops, when the outdoor unit operates.
(There is trouble in the system that provides feedback of motor rotation speed from the motor to the outdoor unit controller.)

[Trouble symptom 4] Fan motor rotation speed does not change during outdoor unit operation.

[Trouble symptom 5] Fan motor rotation speed varies excessively during outdoor unit operation.

(Remedy for symptom 3 to 5)

It is not possible to identify whether the trouble is outdoor unit controller trouble or motor trouble.
Therefore, first replace the outdoor unit controller, then (if necessary) replace the DC motor.

10-5. Noise Malfunction and Electromagnetic Interference

An inverter A/C operates using pulse signal control and high frequencies. Therefore, it is susceptible to the effects of external noise, and is likely to cause electromagnetic interference with nearby wireless devices.

A noise filter is installed for ordinary use, preventing these problems. However, depending on the installation conditions, these effects may still occur. Please pay attention to the points listed below.

(1) Noise malfunction

This refers to the application of high-frequency noise to the signal wires, resulting in abnormal signal pulses and malfunction.

Locations most susceptible to noise	Trouble	Correction
1. Locations near broadcast stations where there are strong electromagnetic waves 2. Locations near amateur radio (short wave) stations 3. Locations near electronic sewing machines and arc-welding machines	Either of the following trouble may occur. 1. The unit may stop suddenly during operation. 2. Indicator lamps may flicker.	(The fundamental concept is to make the system less susceptible to noise.) - Insulate for noise or distance from the noise source. - 1. Use shielded wires. 2. Move unit away from the noise source.

(2) Electromagnetic interference

This refers to noise generated by high-speed switching of the microcomputer and compressor. This noise radiates through space and returns to the electric wiring, affecting any wireless devices (televisions, radios, etc.) located nearby.

Locations most susceptible to noise	Trouble	Correction
1. A television or radio is located near the A/C and A/C wiring. 2. The antenna cable for a television or radio is located close to the A/C and A/C wiring. 3. Locations where television and radio signals are weak.	1. Noise appears in the television picture, or the picture is distorted. 2. Static occurs in the radio sound.	1. Select a separate power source. 2. Keep the A/C and A/C wiring at least 1 meter away from wireless devices and antenna cables. 3. Change the wireless device's antenna to a high-sensitivity antenna. 4. Change the antenna cable to a BS coaxial cable. 5. Use a noise filter (for the wireless device). 6. Use a signal booster.

11. CHECKING ELECTRICAL COMPONENTS

11-1. Measurement of Insulation Resistance

- The insulation is in good condition if the resistance exceeds 1M ohm.

11-1-1. Power Supply Cord

Clamp the grounding wire of power cord with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power wires. (Fig. 1)
Then also measure the resistance between the grounding and other power terminals. (Fig. 1)

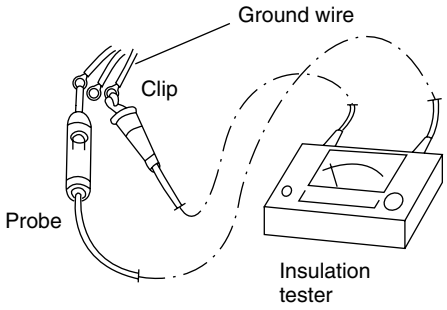


Fig. 1

11-1-2. Indoor Unit

Clamp an aluminum plate fin or copper tube with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw where power supply lines are connected on the terminal plate. (Fig. 2)

11-1-3. Outdoor Unit

Clamp an aluminum plate fin or copper tube with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw on the terminal plate. (Fig. 2)
Note that the ground line terminal should be skipped for the check.

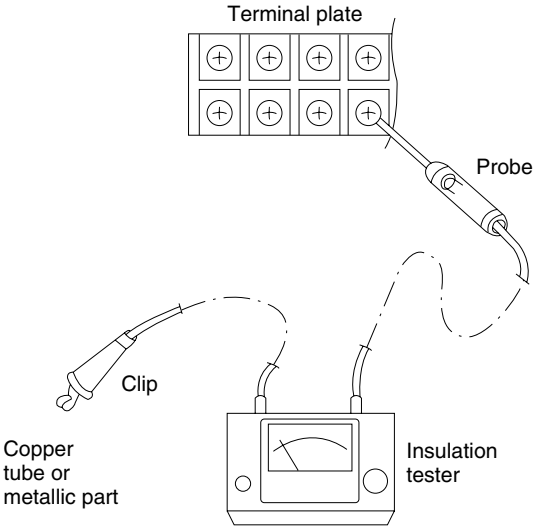


Fig. 2

11-1-4. Measurement of Insulation Resistance for Electrical Parts

Disconnect the lead wires of the desired electric part from terminal plate, capacitor, etc. Similarly disconnect the connector. Then measure the insulation resistance. (Figs. 3 and 4)

NOTE

Refer to Electric Wiring Diagram.
If the probe cannot enter the poles because the hole is too narrow then use a probe with a thinner pin.

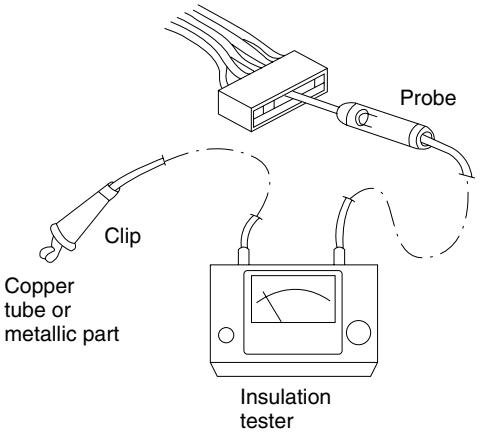


Fig. 3

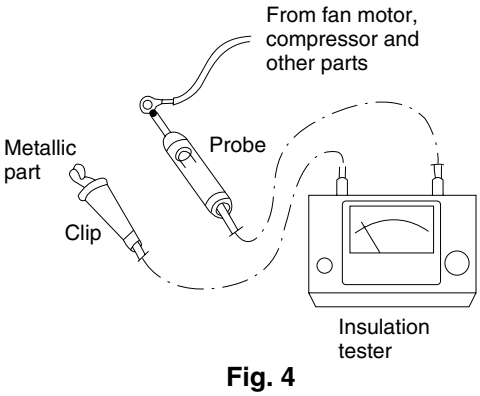


Fig. 4

11-2. Checking Continuity of Fuse on PCB Ass'y

- Remove the PCB Ass'y from the electrical component box. Then pull out the fuse from the PCB Ass'y. (Fig. 5)
- Check for continuity using a multimeter as shown in Fig. 6.

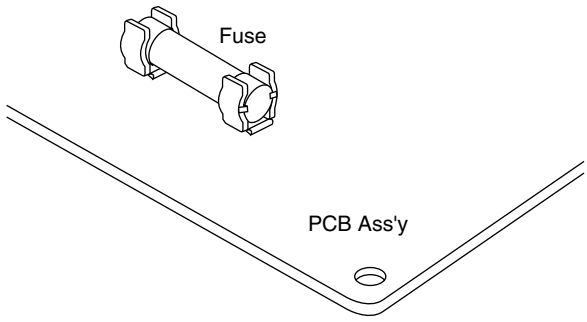


Fig. 5

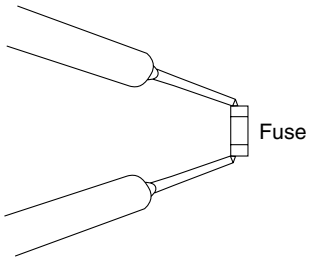


Fig. 6

12. REFRIGERANT R410A: SPECIAL PRECAUTIONS WHEN SERVICING UNIT

12-1. Characteristics of New Refrigerant R410A

12-1-1. What is New Refrigerant R410A?

R410A is a new refrigerant that contains two types of pseudo-non-azeotropic refrigerant mixture. Its refrigeration capacity and energy efficiency are about the same level as the conventional refrigerant, R22.

12-1-2. Components (mixing proportions)

HFC32 (50%) / HFC125 (50%)

12-1-3. Characteristics

- Less toxic, more chemically stable refrigerant
- The composition of refrigerant R410A changes whether it is in a gaseous phase or liquid phase. Thus, when there is a refrigerant leak the basic performance of the air conditioner may be degraded because of a change in composition of the remaining refrigerant. ***Therefore, do not add new refrigerant.*** Instead, recover the remaining refrigerant with the refrigerant recovery unit. Then, after evacuation, totally recharge the specified amount of refrigerant with the new refrigerant at its normal mixed composition state (in liquid phase).
- When refrigerant R410A is used, the composition will differ depending on whether it is in gaseous or liquid phase, and the basic performance of the air conditioner will be degraded if it is charged while the refrigerant is in gaseous state. ***Thus, always charge the refrigerant while it is in liquid phase.***

CAUTION

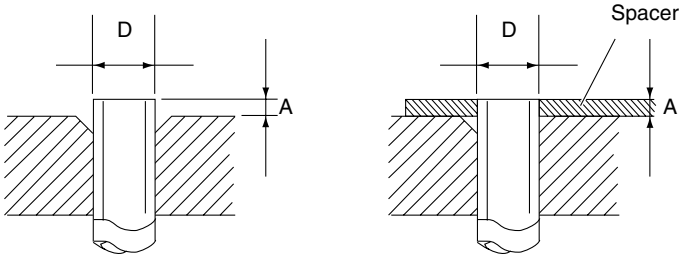
Ether-type oil is used for compressor oil for R410A-type units, which is different from the mineral oil used for R22. Thus more attention to moisture prevention and faster replacement work compared with conventional models are required.

12-2. Checklist before Servicing

Use a clutch-type flare tool for R410A or the conventional flare tool. Note that sizes of the resultant flares differ between these two tools. Where a conventional flare tool is used, make sure to observe A Specification (amount of extrusion) by using the flare spacer.

Diameter of tube D	Specification A	
	Flare tool for R410A	Conventional flare tool (for R22)
Dia.6.35 mm (1/4")	0 to 0.5 mm	1.2 mm
Dia.9.52 mm (3/8")		
Dia.12.7 mm (1/2")		
Dia.15.88 mm (5/8")		

- **Size of flare**



Flare tool for R410A Conventional flare tool (R22)

- **Tubing precautions**

- Refrigerant R410A is more easily affected by dust or moisture compared with R22, thus be sure to temporarily cover the ends of the tubing with caps or tape prior to installation.

  Never use 0.7mm-thick copper tubing or tubing which is less than 0.8mm in thickness, since air conditioners with R410A are subject to higher pressure than those using R22 and R407C.

- **No addition of compressor oil for R410A**

  No additional charge of compressor oil is permitted.

- **No use of refrigerant other than R410A**

  Never use a refrigerant other than R410A.

- **If refrigerant R410A is exposed to fire**

  Through welding, etc., toxic gas may be released when R410A refrigerant is exposed to fire. Therefore, be sure to provide ample ventilation during installation work.

- **Caution in case of R410A leak**

  Check for possible leak points with the special leak detector for R410A. If a leak occurs inside the room, immediately provide thorough ventilation.

12-3. Tools Specifically for R410A

● **For servicing, use the following tools for R410A**

Tool Distinction	Tool Name
Tools specifically for R410A	● Gauge manifold ● Charging hose ● Gas leak detector ● Refrigerant cylinder ● Charging cylinder ● Refrigerant recovery unit ● Vacuum pump with anti-reverse flow (*1) (Solenoid valve-installed type, which prevents oil from flowing back into the unit when the power is off, is recommended.) ● Vacuum pump (*2)...can be used if the following adapter is attached. ● Vacuum pump adapter (reverse-flow prevention adapter) (*3). (Solenoid valve-installed adapter attached to a conventional vacuum pump.) ● Electronic scale for charging refrigerant ● Flare tool
Tools which can be commonly used for R22, R407C, and R410A	● Bender ● Torque wrench ● Cutter, reamer ● Welding tool, nitrogen gas cylinder

CAUTION

- **The above tools specifically for R410A must not be used for R22 and R407C. Doing so will cause malfunction of the unit.**
- **For the above vacuum pump (*1, *2) and vacuum pump adapter (*3), those for R22-type units can be used for R410A-type. However, they must be used exclusively for R410A and never alternately with R22 and R407C.**

● To prevent other refrigerants (R22, R407C) from being mistakenly charged to this unit, shape and external diameter of the service port screw has been altered.
<External diameter of service port> R410A : 7.94 mm (5/16")
R22, R407C : 6.35 mm (1/4")

12-4. Tubing Installation Procedures

When the tubes are connected, ***always apply HAB oil on the flare portions to improve the sealing of tubing.***
The following is the **HAB oil** generally used:
Esso: ZERICE S32

NOTE For details on tubing installation procedures, refer to the installation manuals attached to the indoor unit and outdoor unit.

12-5. In Case of Compressor Malfunction

CAUTION

- **Should the compressor malfunction, be sure to make the switch to a replacement compressor as quickly as possible.**
- **Use only the tools indicated exclusively for R410A. → See "12-3. Tools Specifically for R410A."**

12-5-1. Procedure for Replacing Compressor

(1) Recovering refrigerant

- Any remaining refrigerant inside the unit should not be released to the atmosphere, but recovered using the refrigerant recovery unit for R410A.
- Do not reuse the recovered refrigerant, since it will contain impurities.

(2) Replacing Compressor

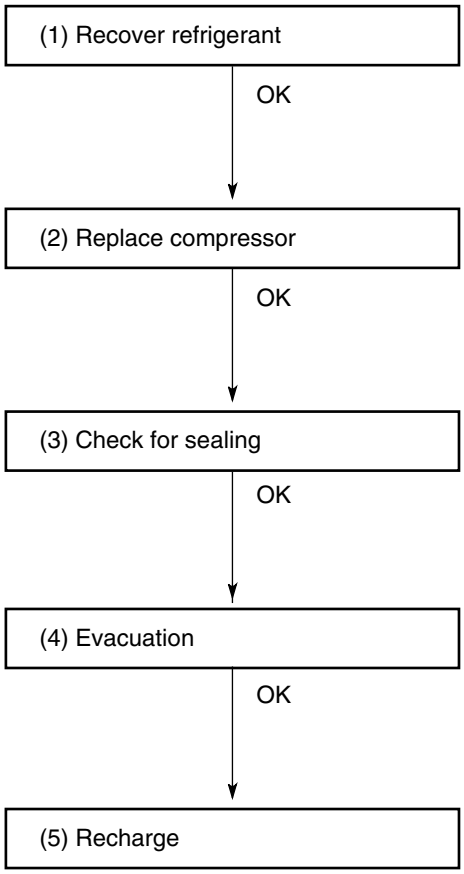
- Soon after removing seals of both discharge and suction tubes of the new compressor, replace it quickly.

(3) Checking for sealing

- Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R410A. Also do not use oxygen or any flammable gas.

(4) Evacuation

- ***Use a solenoid valve-installed vacuum pump*** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.
- The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.
- When using a vacuum pump with exhaust air volume more than 25L/min. and ultimate vacuum pressure rate of 0.05Torr.



Standard time for evacuation

Length of tubing	Less than 10 meters	More than 10 meters
Evacuation time	More than 10 minutes	More than 15 minutes

(5) Recharging

- ***Be sure to charge the specified amount of refrigerant in liquid state*** using the service port of the wide tube service valve. The proper amount is listed on the unit's nameplate.

  When the entire amount cannot be charged all at once, charge gradually while operating the unit in Cooling Operation.

CAUTION

Never charge a large amount of liquid refrigerant at once to the unit. This may cause damage to the compressor.

- When charging with a refrigerant cylinder, use an electronic scale for charging refrigerant. In this case, if the volume of refrigerant in the cylinder becomes less than 20% of the fully-charged amount, the composition of the refrigerant starts to change. Thus, ***do not use the refrigerant if the amount in the charging cylinder is less than 20%.***

  Also, charge the minimum necessary amount to the charging cylinder before using it to charge the air conditioning unit.

Example:

In case of charging refrigerant to a unit requiring 0.76Kg using a capacity of a 10Kg cylinder, the minimum necessary amount for the cylinder is:

$$0.76 + 10 \times 0.20 = 2.76\text{Kg}$$

For the remaining refrigerant, refer to the instructions of the refrigerant manufacturer.

- If using a charging cylinder, transfer the specified amount of liquid refrigerant from the refrigerant cylinder to the charging cylinder.

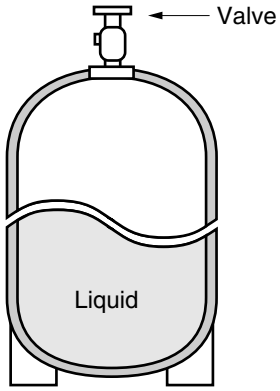
  Prepare an evacuated charging cylinder beforehand.

CAUTION

- **To prevent the composition of R410A from changing, never bleed the refrigerant gas into the atmosphere while transferring the refrigerant. (Fig. 3)**

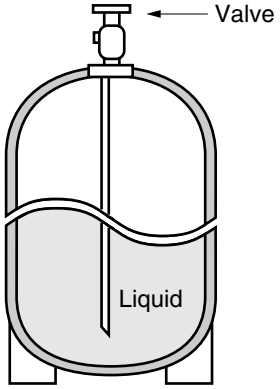
Do not use the refrigerant if the amount in the charging cylinder is less than 20%.

Configuration and characteristics of cylinders



Single valve
Charge liquid refrigerant with cylinder in up-side-down position.

Fig. 1



Single valve (with siphon tube)
Charge with cylinder in normal position.

Fig. 2

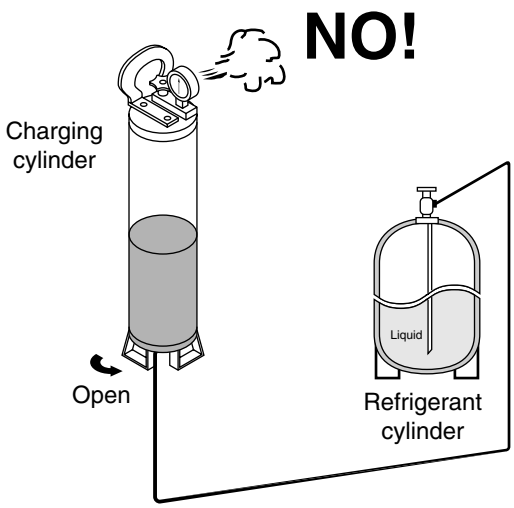


Fig. 3

12-6. In Case Refrigerant is Leaking

CAUTION

Never attempt to charge additional refrigerant when refrigerant has been leaking from the unit. Follow the procedure described below to locate points of leaks and carry out repairs, then recharge the refrigerant.

(1) Detecting Leaks

- Use the detector for R410A to locate refrigerant leak points.

(2) Recovering refrigerant

- Never release the gas to the atmosphere; recover residual refrigerant using the refrigerant recovery unit for R410A, instead.
- Do not reuse the recovered refrigerant because its composition will have been altered.

(3) Welding leaking points

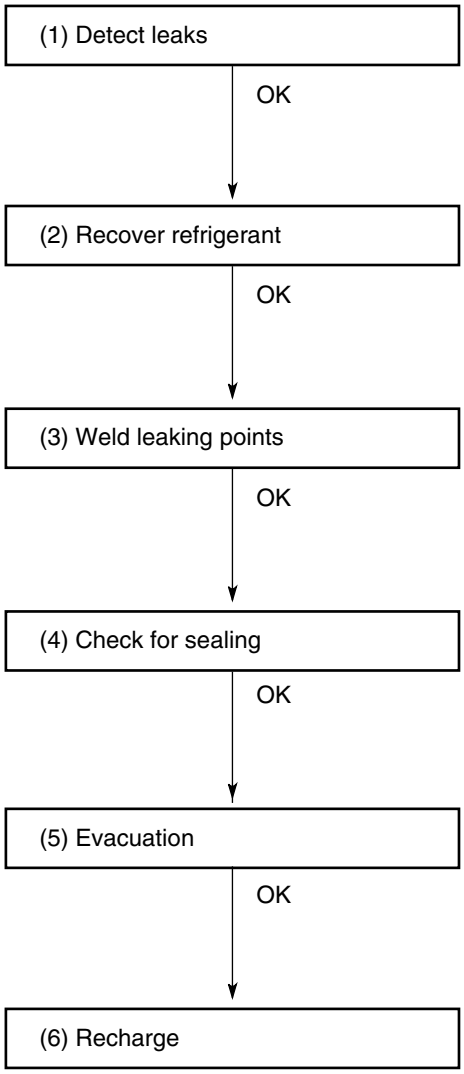
- Confirm again that no residual refrigerant exists in the unit before starting welding.
- Weld securely using flux and wax for R410A.
- Prevent oxide film from forming inside the tubes utilizing substitution with nitrogen (N2) in the refrigerant circuit of the unit. Leave ends of tubes open during welding.

(4) Checking for sealing

- Use nitrogen gas for the pressurized gas, and never use a refrigerant other than R410A. Also do not use oxygen or any flammable gas.

(5) Evacuation

- ***Use a solenoid valve-installed vacuum pump*** so that even if power is cut off in the middle of evacuation of air due to a power interruption, the valve will prevent the pump oil from flowing back.
- The equipment may be damaged if moisture remains in the tubing, thus carry out the evacuation thoroughly.
- When using a vacuum pump with exhaust air volume more than 25L/min. and ultimate vacuum pressure rate of 0.05Torr.



Standard time for evacuation

Length of tubing	Less than 10 meters	More than 10 meters
Evacuation time	More than 10 minutes	More than 15 minutes

(6) Recharging

- Recharge unit in the same manner explained on the previous page "(5) Recharging."

12-7. Charging Additional Refrigerant

12-7-1. When Tubes are Extended

- Observe the proper amount of refrigerant as stated in this service manual or the installation manual that came with the indoor unit. ***Charge additional refrigerant in liquid state only.***

Never charge additional refrigerant if refrigerant is leaking from the unit. Follow instructions given in "12-6. In Case Refrigerant is Leaking" and completely carry out repairs. Only then should you recharge the refrigerant.

12-8. Retro-Fitting Existing Systems

12-8-1. Use of Existing Units

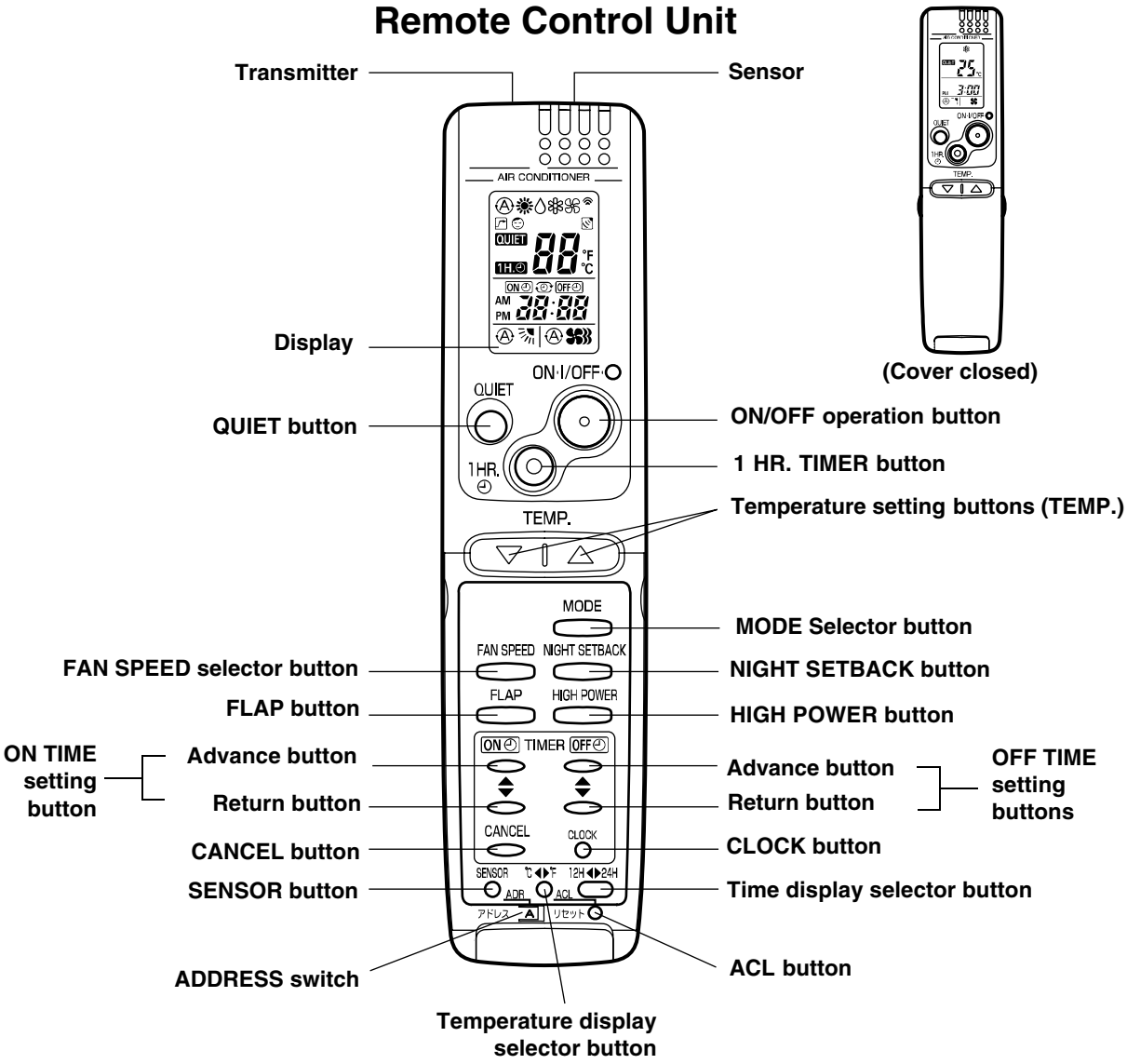
- ***Never use new refrigerant R410A for existing units which use R22.*** This will cause the air conditioner to operate improperly and may result in a hazardous condition.

12-8-2. Use of Existing Tubing

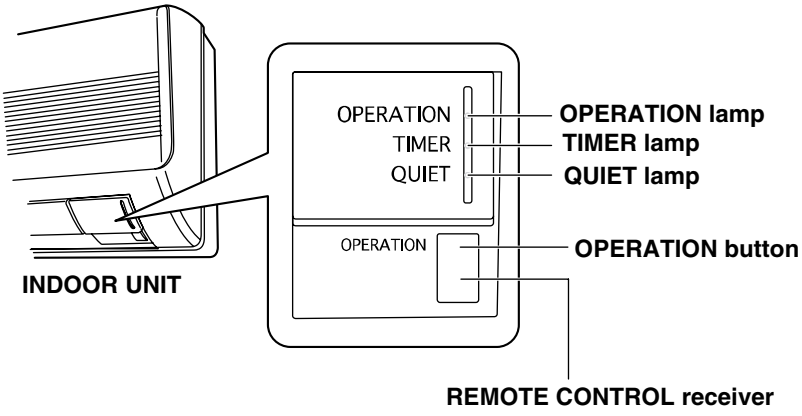
- If replacing an older unit that used refrigerant R22 with a R410A unit, ***do not use its existing tubing.*** Instead, completely new tubing must be used.

APPENDIX

Remote Control Unit



Unit Display and Operation Button



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